FLIGHT

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Re-equipment

THE Centenary Celebrations of the State of Victoria are to be attended by No. 203 (Flying Boat) Squadron from Basra in full force; that is to say, flying three "Rangoons." The visit will certainly be a compliment to the 100-year-old State, for Basra is a long way from Melbourne, and it will be no small feat to fly from the Persian Gulf to Australia. That the "Rangoons" and their "Jupiter" engines should carry the flight through successfully we feel no doubt, for both boats and engines are as trustworthy as the best. Incidentally, the officers and men of the Royal Australian Air Force will be interested to see the "Rangoons," for the flying boat equipment of that Force for a good many years past has consisted of two wooden "Southamptons" and a flight of deck-landing "Seagull" amphibians. Some years ago Australia received a visit from four metal "Southamptons" of what is now No. 205 (F.B.) Squadron, but that is the sum total of what Australia has seen of the flying boats of the Royal Air Force.

The "Rangoon" was produced by Short Bros. as the R.A.F. version of the "Calcutta" commercial flying boat which once served Imperial Airways very well on the crossing of the Mediterranean. The three-engined "Calcutta" has long since been replaced on that route by the four-engined "Scipio" class, but the "Rangoon" still remains the most modern flying boat owned by the overseas Commands of the Royal Air Force. In fact, with the exception of the "Perth," which has recently been supplied to No. 209 (F.B.) Squadron at Mount Batten, it is the most modern boat possessed by any R.A.F. squadron. It was only about a fortnight ago that the Air Ministry announced that No. 205 (F.B.) Squadron is to receive the "Singapore" with four "Kestrels" instead of the time-honoured "Southamptons," with which, as we remarked above, Australia is familiar. It is not impossible that some confusion may arise from stationing "Singapores" at Singapore, but, apart from that, this news is very welcome. We should like some more of the same sort.

It is impossible to help wondering what spirit of lethargy has fallen upon the department of the Air Ministry whose duty it is to decide upon the re-equipping of flying boat squadrons. For months past it has been known that some squadron was to get the "Singapore" and some other squadron or squadrons should have the "Scapa"; while it has also been common knowledge that a real desire had arisen to equip No. 202 (F.B.) Squadron at Malta with boats instead of their ancient floatplanes. That a definite programme had been drawn up seemed fairly certain, and all seemed going swimmingly when some technical reason caused a halt to be called. That was probably inevitable; but why halt for so long? Re-equipment of the flying-boat squadrons is overdue, and we do not want the new types to grow out of date before they are issued to the squadrons.

More Generalities

MR. FOKKER has given an interview to some journalists, in which, following the injudicious example of Mr. Baldwin, he has indulged in some generalities on what will happen in the next war. Mr. Fokker's opinion will command some respect, possibly too much.

He is reported to have said that in the future an air attack will be made before there has been any declaration of war. Great skill in aeroplane design hardly makes him an authority on the future of diplomatic relations, and we may listen to this personal opinion of his without accepting it as gospel. If any Power were really likely to behave in such a way there would be no great competition among its nationals for the post of Ambassador to the capital of the country which might be so attacked. Next, he is reported to have said that the attack would be stronger than the

defence. There he speaks with more authority, and no one has ever asserted that absolute defence in the air is possible. He admits that the attack will first of all be aimed at military objectives, though they would "at the same time bring disaster to the civil population." From his subsequent words that "of course, gas will be used," it may be deduced that he thinks deliberate attacks will be made on civilians, though he much doubts the efficacy of gas. This, of course, is merely the doctrine of frightfulness over again, and the great war confirmed the previous teaching of all history that frightfulness practised on a virile nation is no short cut to victory, but must recoil on the head of the criminal who starts it.

Mr. Fokker went on to say that soon after the outbreak of war there would be a shortage of highly trained pilots and mechanics. At last he is on quite safe ground. That will probably happen; and this admission takes the sting out of many of Mr. Fokker's previous remarks. Evidently the air offensive will be of short duration according to his admission, the damage done will be approximately equal on both sides (which is a fair inference from his words), and neither side will be beaten to its knees. It follows that the navies and the armies will then get on with the war in the traditional way, while new aeroplanes are being built and new pilots trained.

Of course, there is no telling what an insensate Government will do, but one must presume a measure of sanity on both sides, and it would only be the barest common sense to try to get the utmost possible advantage out of one's short-lived air force. The greatest pains would be taken by every sane belligerent to ensure that each bomb dropped would give the maximum advantage by doing the greatest harm to the enemy's fighting efficiency. There is no comparison between the advantage of crippling a munitions factory and that of killing a number of civilians.

Mr. Fokker seems to have brushed aside the question of air defence as unworthy of much consideration. We are not inclined to admit him as the ultimate authority on that point.

It is interesting to note that the more weighty of the French papers are showing a distinct tendency to belittle the doctrine that the only form of air defence is to attack the cities of the enemy, and are taking a greater interest than before in the possibilities of actual defensive measures. The doctrine taught in our Air Force Staff College as regards bombing is that of the military objective, a policy which brings the greatest relief to the defence. It may even force some day bombers to be retained at home as defensive fighters.

However that may be, in the last war our defence got stronger as time went on, and finally, in the Whitsun raid, we took such toll of the raiders that they never came to London again. Mr. Fokker may try to make our flesh creep, but the practical thing to do is to make our defence as strong as possible.

GREAT STUFF! The Bass Rock in the Firth of Forth, the home of the Solan goose or gannet, is a familiar sight to visitors to the popular resort of North Berwick. This photograph shows one of the "Harts" ("Kestrel") of No. 603 (City of Edinburgh) (Bomber) Squadron flying past the Bass Rock.

The Outlook

A Running Commentary on Air Topics

An England-Melbourne "Canard"

MUCH publicity has been given to the fact that the Great Circle course between Baghdad and Allahabad passes over a prohibited area on the North-West Frontier of India, and that to avoid it will add considerably to the distance to be flown between these points. Actually, the extra distance is less than 200 miles. It is quite clear from the rules of the competition that competitors have to adhere to the flying regulations of every country which they cross, and that trouble caused by breaking those regulations will involve disqualification. There have been no grounds for the suggestion that any of the ordinary regulations will be waived for the race. The direct course from London to Baghdad also passes over prohibited areas, so competitors will either have to fly round them or take the risk of possible disqualification.

The Handicap Race

A POINT which does not seem to be generally understood is that competitors in the England-Melbourne race who are flying in the handicap need not land at, or visit, all or any of the "checking" points. They must, however, land and check in at the "control points" in the same manner as the competitors in the speed race. Checking points are really only for the convenience of those who have insufficient fuel to fly direct from one control point to the next. There is also nothing to prevent competitors from landing at places other than the control points for their fuel. It is possible that by so doing they may be able to refuel in peace and comfort at a greater speed than they could do if they were to take their fuel on board at the control points, where there might be considerable congestion.

Jargon

EVERYBODY who served in the Army during the war was taught, to his unalloyed delight, that the haversack should contain "the unexpended portion of the previous day's ration." The war is over, but the jargon of Government offices goes on. There was quite a gem in the recent Air Ministry announcement about providing careers for airmen, extracts of which appeared in our issue of August 16. "In certain trades," wrote the scribes of the Air Ministry, "where, owing to the small numbers involved, the provision of an adequate career on a Service basis is impracticable, and where continuity of employment is desirable, a policy of civilianisation has been adopted." The official, officer or clerk, who invented that word must have been enormously pleased with himself. Yet, if one were to meet him, he would probably prove to be quite a normal person, and in his ordinary conversation he may even indulge in popular slang

We find another sweet little example of jargon in a more recent Air Ministry order, possibly written by the same jargon genius. The order is concerned with forms on which tenders for chimney-sweeping contracts are to be made. New forms are to be introduced, and the Air Ministry wants to make sure that the old forms are put completely out of harm's way. An ordinary man would say, "Throw them away," or "Put them in the waste-paper basket," but that, of course, would not be nearly stilted enough for a Government Department. "Destroyed" strikes one as a word which would have met the case; but it evidently did not satisfy. What the order actually says is "All copies of earlier prints are to be immediately disposed of as waste." There are probably complicated rules for the disposal of waste. Possibly old papers must not be destroyed, but must be kept for lighting fires in the winter. If so, the jargon genius was justified in eschewing the word "destroyed." In any case, we wish, as the Irishman said, more power to his elbow. He contrives to brighten a dull feature of a drab world.

Another Man's Poison

THE finding of a court of enquiry on the wreck of a motor ship in Table Bay makes quaint reading for those concerned with aviation.

The master of the vessel said he mistook the red flashing light which warns airmen of the wireless masts at Milnerton for the breakwater light. The court cleared the master and put all the blame on the air beacon, recommending the immediate removal of *the danger* in order to protect shipping and preserve the port's good name.

Would the same court exonerate an air pilot from all blame if he foolishly mistook the breakwater light for the wireless mast light and plunged into the harbour? Common sense would dictate a recommendation that the two lights should be made unmistakably distinct from each other, and not that one of them should be removed to the imminent peril of air traffic.

Samuel Pierpont Langley

IT is rather strange to think that August 22 was the 100th anniversary of the birth of Langley, for he overlaps with the present generation. He died in February, 1906, within the easy memory of many men now in middle age, and his work for aeronautics was contemporary with that of Wilbur and Orville Wright, the latter of whom is still with us. His work in developing practical aeronautics was of the greatest value, and yet it is hard to find a special niche for him in aeronautical history as being certainly the first in either design or in practical flight. The theory of flight had been solved by Sir George Caley, and the first model aeroplane to fly under its own power was designed and made by John Stringfellow, both Englishmen. From lack of a power unit with a suitable weight/power ratio, neither was able to produce a man-carrying aeroplane. The work of these two men was available for Langley to study but he seems to have indulged in independent investigations. In 1903, when Langley was over sixty years of age, the American War Department voted 50,000 dollars to the construction of a man-carrying aeroplane, and Langley devoted himself to the task. An engine was designed for it by C M Manly, who also acted as pilot of the machine, which was called an 'aerodrome We laugh at the word now but actually it is less incorrect when applied to a flying machine than when used, on the analogy of hippodrome, for a flying field. Langley s machine was launched by gear from the top of a houseboat, but owing to some defect in the gear the machine crashed into the water, and the pilot was almost drowned. The money had then all been spent, and the experiment was abandoned. A few days later Orville Wright made the first power-driven flight. Years afterwards, Glen Curtiss modified Langley's machine and flew it successfully, but controversy arose as to whether that proved that Langley's invention had anticipated that of the Wright brothers. Be that as it may, Langley's work was brilliant, and his memory deserves all the honour which the aeronautical fraternity can give it

ORGANISING THE MACROBERTSON RACE

By EDWARD J. HART

[The writer of these notes is the former editor-owner of the Australian journal "Aircraft" which he established 17 years ago. He founded the Associated Aero Clubs of Australia and the Australian Aircraft Traders' Association. Besides acting for some years as Commonwealth Director of Aviation Publicity, Mr. Hart was a member of the committee which organised the first race from England to Australia.]

SO much nonsense is being talked and written about the "perils" of the MacRobertson race that one is tempted to compare the elaborate safeguards which have been provided by the Air Race Committee in Melbourne with the grotesquely casual "arrangements" made fifteen years ago by the promoters of the first race to Australia.

The Route in 1919

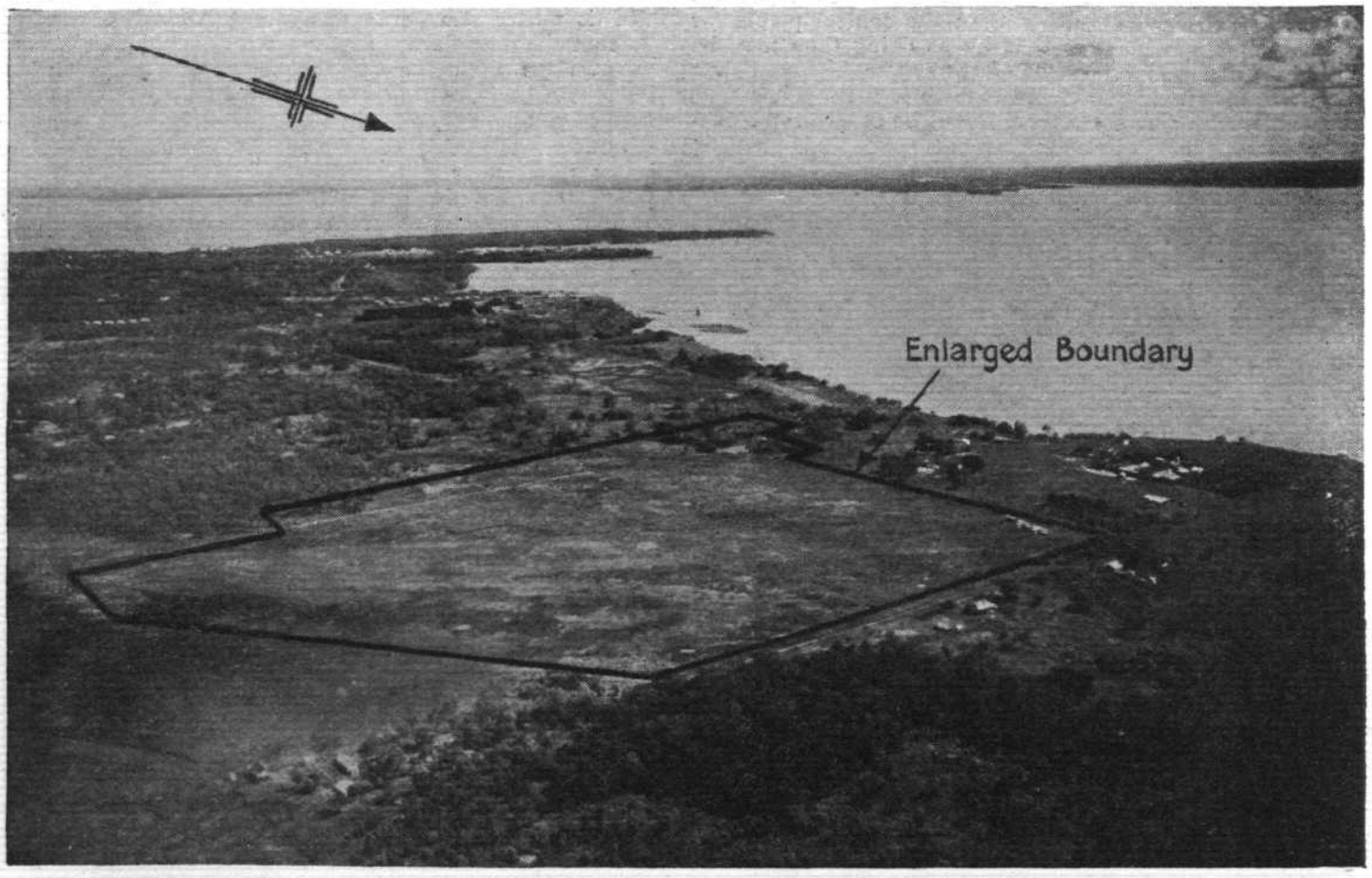
The ink had scarcely dried on the Treaty of Versailles when Australia's Prime Minister, the Right Hon. W. M. Hughes, made the following announcement:—

> For the purpose of fostering civil aviation in Australia the Commonwealth Government has decided to offer a cash prize of £10,000 to the pilot of the first aeroplane, manned by an Australian crew, which shall fly from London to Port Darwin within 720 consecutive hours, such flight to be completed by December 31, 1919.

Possibly Mr. Hughes had some vision of a four-squadron Australian Flying Corps (services no longer required) repatriating itself to the Antipodes under its own power. Actually, no contest could have been more ill-timed or have done less to achieve its object, for the Government which sponsored it was almost the last in the world to enforce the Air Navigation Act which, not until two years later, was to bring civil aviation in Australia under proper control. Its attitude towards would-be competitors was: "We are providing the prize money; you must do the rest."

And there was much to be done. The route had never been flown over. There were neither maps nor meteorological stations. Directional wireless was unheard of. There was not one civil aerodrome or prepared landing ground on the entire route. And although the race nominally ended at Darwin, competitors were asked to fly an extra 3,000 miles to attend official receptions in Brisbane, Sydney, Melbourne, and Adelaide. More remarkable still, some of them actually did so. As to landing grounds, they were told to use their own judgment.

The race was to be contested under the competition rules of the R.Ae.C. As honorary secretary of the affiliated



THE FIRST STOP IN AUSTRALIA: An aerial view of Darwin. The aerodrome is being enlarged, the new boundary line being shown. *(Royal Australian Air Force Official Photograph.)*

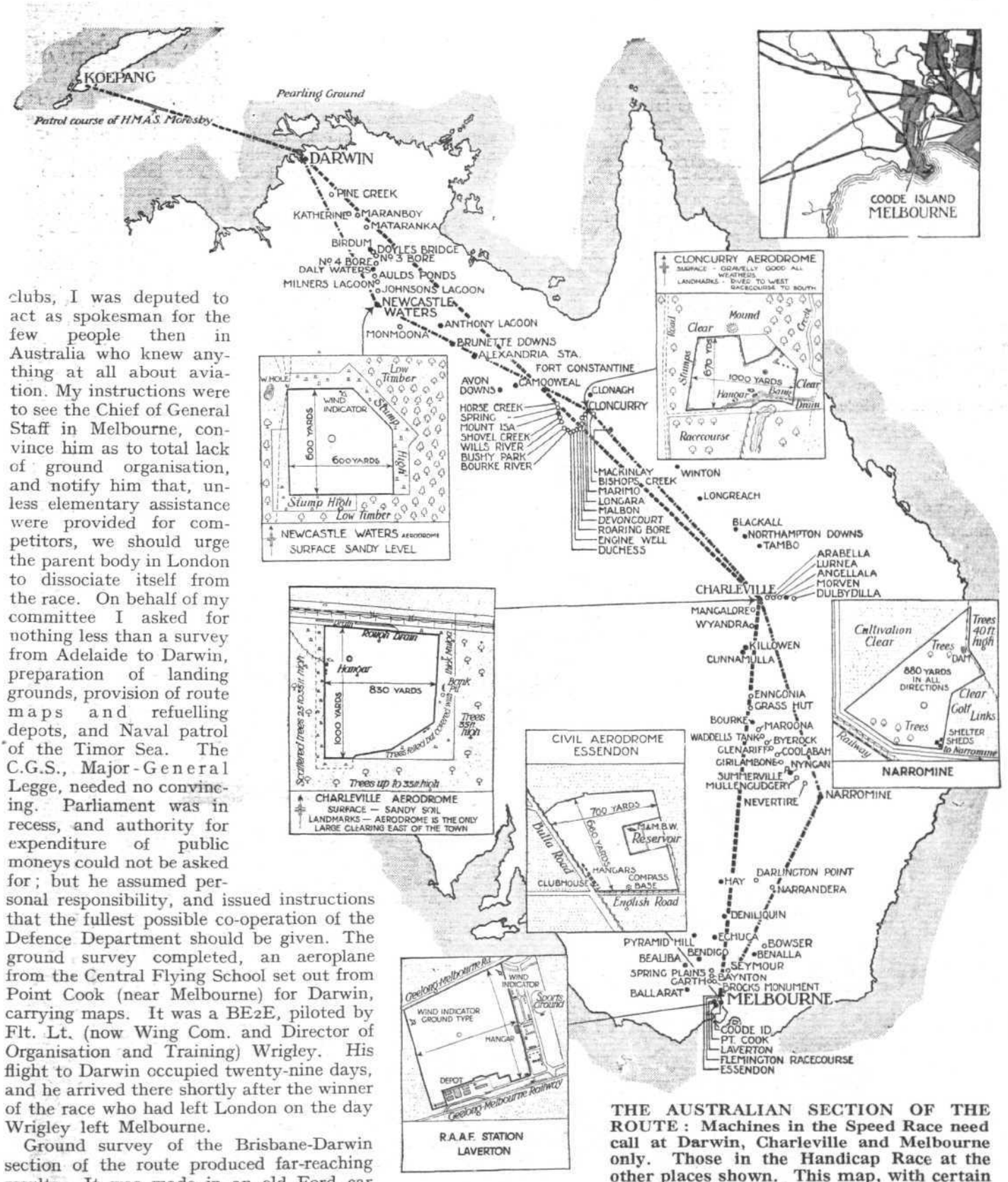
clubs, I was deputed to act as spokesman for the few people then in Australia who knew anything at all about aviation. My instructions were to see the Chief of General Staff in Melbourne, convince him as to total lack of ground organisation, and notify him that, unless elementary assistance were provided for competitors, we should urge the parent body in London to dissociate itself from the race. On behalf of my committee I asked for nothing less than a survey from Adelaide to Darwin, preparation of landing grounds, provision of route maps and refuelling depots, and Naval patrol of the Timor Sea. The C.G.S., Major-General Legge, needed no convincing. Parliament was in recess, and authority for expenditure of public moneys could not be asked for; but he assumed personal responsibility, and issued instructions that the fullest possible co-operation of the Defence Department should be given. The ground survey completed, an aeroplane from the Central Flying School set out from Point Cook (near Melbourne) for Darwin, carrying maps. It was a BE2E, piloted by Flt. Lt. (now Wing Com. and Director of Organisation and Training) Wrigley. His flight to Darwin occupied twenty-nine days, and he arrived there shortly after the winner of the race who had left London on the day Wrigley left Melbourne.

Ground survey of the Brisbane-Darwin section of the route produced far-reaching results. It was made in an old Ford car by two ex-lieutenants of the A.F.C., Paul McGinnis and Hudson Fysh. This was their first acquaintance with the vast undeveloped hinterland, roadless and wholly devoid of communications. Recognising its possibilities, they broke their return journey at Longreach, won the financial support of a group of West Queensland squatters, went on to Sydney, bought an Avro 504K, and registered the enterprise as the Western Graziers' Aviation Co., Ltd. Its title was later changed to Queensland and Northern Territory Aerial Services, Ltd., and, very recently, to Qantas Empire Airways, Ltd., with "Huddie" Fysh as managing director.

It is noteworthy also that every stopping place chosen by the winner of the 1919 race is now a well-equipped aerodrome on Imperial Airways Far-East route, with the exception of Lyons—the limit of his first day's effort.

In all other respects, however, the first race to Australia proved far more costly than its sponsor could have foreseen. Mr. Hughes later told me that, to him, it had been "a hideous nightmare from start to finish." Alarmed by the growing casualty list, and forgetting that it was a "race," he cabled to each surviving competitor: "Am confident you will do your best, but do not hurry or take undue risks."

Six teams started. Two teams finished, two teams were killed, the others crashed and continued to Australia by sea. The winning team left Hounslow on November 12th and reached Darwin twenty-eight days later. They were



THE AUSTRALIAN SECTION OF THE ROUTE: Machines in the Speed Race need call at Darwin, Charleville and Melbourne only. Those in the Handicap Race at the other places shown. This map, with certain additions, will soon be issued to competitors.

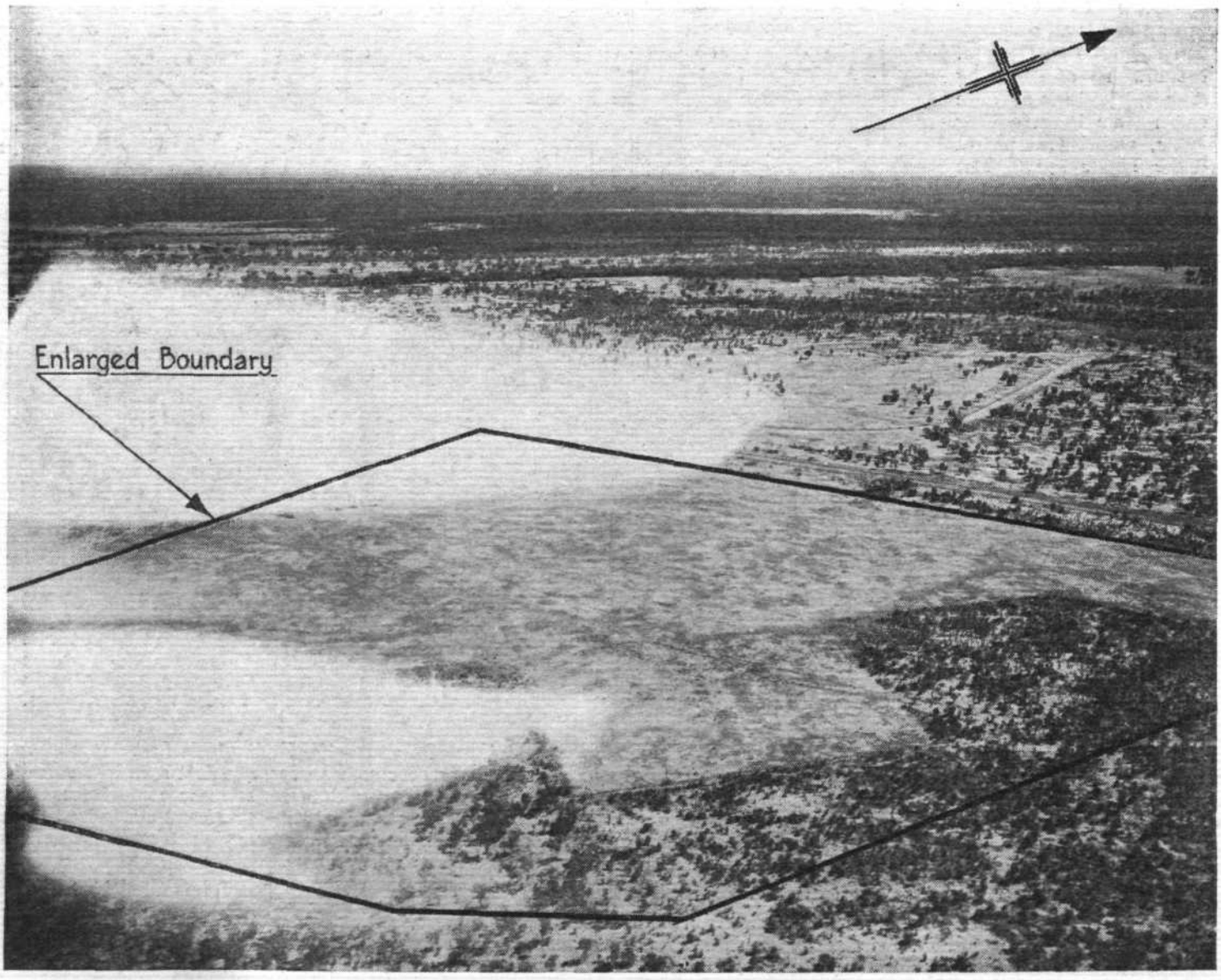
the late Sir Ross Smith, Sir Keith Smith and Sergeant-mechanics W. H. Shiers and the late J. M. Bennett. Vickers had lent them a converted bomber (Vimy, two 360 h.p. Rolls Eagle VIII), which was later presented to the Australian War Museum. Lts. Ross and Douglas, in an overloaded Alliance "Endeavour," crashed fatally at Surbiton a few minutes after clearing the aerodrome. Capt. Cedric Howell and Sgt.-mechanic George Fraser were drowned off Corfu in a Martinsyde F4. A Blackburn "Kangaroo," manned by Sir Hubert Wilkins (of Antarctic fame), Lts. Reg Williams, Garnet Potts and Valdemar Rendle, came to grief in Crete, and was abandoned on the beach at Suda Bay. Capt. G. C. Matthews and Sgt. Tom Kay, in a Sopwith "Wallaby," crashed at Bali, in Java. Lts. Raymond Parer and the late J. C. McIntosh got through to Melbourne in an old DH9, bought for them by Peter Dawson, the whisky distiller. Most of the six months of their journey was spent on repair work, miles from anywhere. Ray Parer (who was unkindly renamed "Re-Pairer") has entered a Fairey Fox for the MacRobertson race.

The Route in 1934

In 1919 the route may justly have been described as perilous. Since then it has been flown at least thirty times. The late Sq.-Ldr. Hinkler, Sir Alan Cobham, the late Capt. Lancaster and Mrs. Keith Miller, Francis Chichester, Piper and Kay, Mrs. Mollison, Oscar Garden, Sir Charles Kingsford Smith, C. W. A. Scott, C. A. Butler, J. A. Mollison, Jeffrey and Jenkins, R. T. Richards, G. A. Hall, R. Allen, J. R. Herbert, Mrs. Bonney, Taylor, Allen and Ulm, Derek Rawnsley, Rubin and Waller, and, finally, Miss Jean Batten—each of these has contributed to the general knowledge of the England-Australia route. It has been flown by an R.A.F. squadron of flying boats, and, for Imperial Airways, by Major Brackley. The late Marchese de Pinedo flew there, and back, from Rome; Capt. Hans Bartram from Germany; Capt. Pattist and Lt. J. J. Moll, of K.L.M., from Amsterdam. Before the end of this year the Qantas link with London will be in weekly operation. The work of the pioneers is ended. Flights between England and Australia have become commonplace. The reliability of aircraft, engines, instruments, and wireless equipment has been tested to the satisfaction of the bitterest sceptic. For pilots who have chosen as their slogan, "Melbourne or Death in Two Days!" nothing can be done to make the route absolutely foolproof that has not already been done for them by the organisers of the race.

With the contest still seven weeks ahead, with most of the entrants reluctant to discuss their plans, and with the quite definite knowledge that several optimists who have not yet officially withdrawn will be unable to start without the help of still-elusive fairy godmothers, it is refreshing to note the efficient manner in which the Air Race Committee in Melbourne has completed its task.

The committee was formed in March, 1933. For nearly



THE HALF-WAY HOUSE: The aerodrome at Charleville. (*Royal Australian Air Force Official Photograph.*)

eighteen months it has met almost daily. Its minutes—a copy of which I have been allowed to read—are eloquent of the care and foresight with which the preliminary work has been planned and executed.

The chairman of the Air Race Committee is Wing Com. Adrian Trevor Cole, M.C., D.F.C., R.A.A.F.—"King" Cole to his intimates. Numbering myself among the latter for nearly twenty years, I have not hesitated to ask this busy member of the Commonwealth Air Board for the full story of his committee's activities. By the next air mail he sent me sufficient material to fill several issues of *Flight*.

In all its deliberations the committee was guided by the terms of reference as laid down by Sir Macpherson Robertson, whose principal object in promoting the race is to provide world-wide advertisement for the city of Melbourne during the celebration of its hundredth birthday, and, incidentally, "to prove that fast communication between Australia and England is possible." The terms are:—

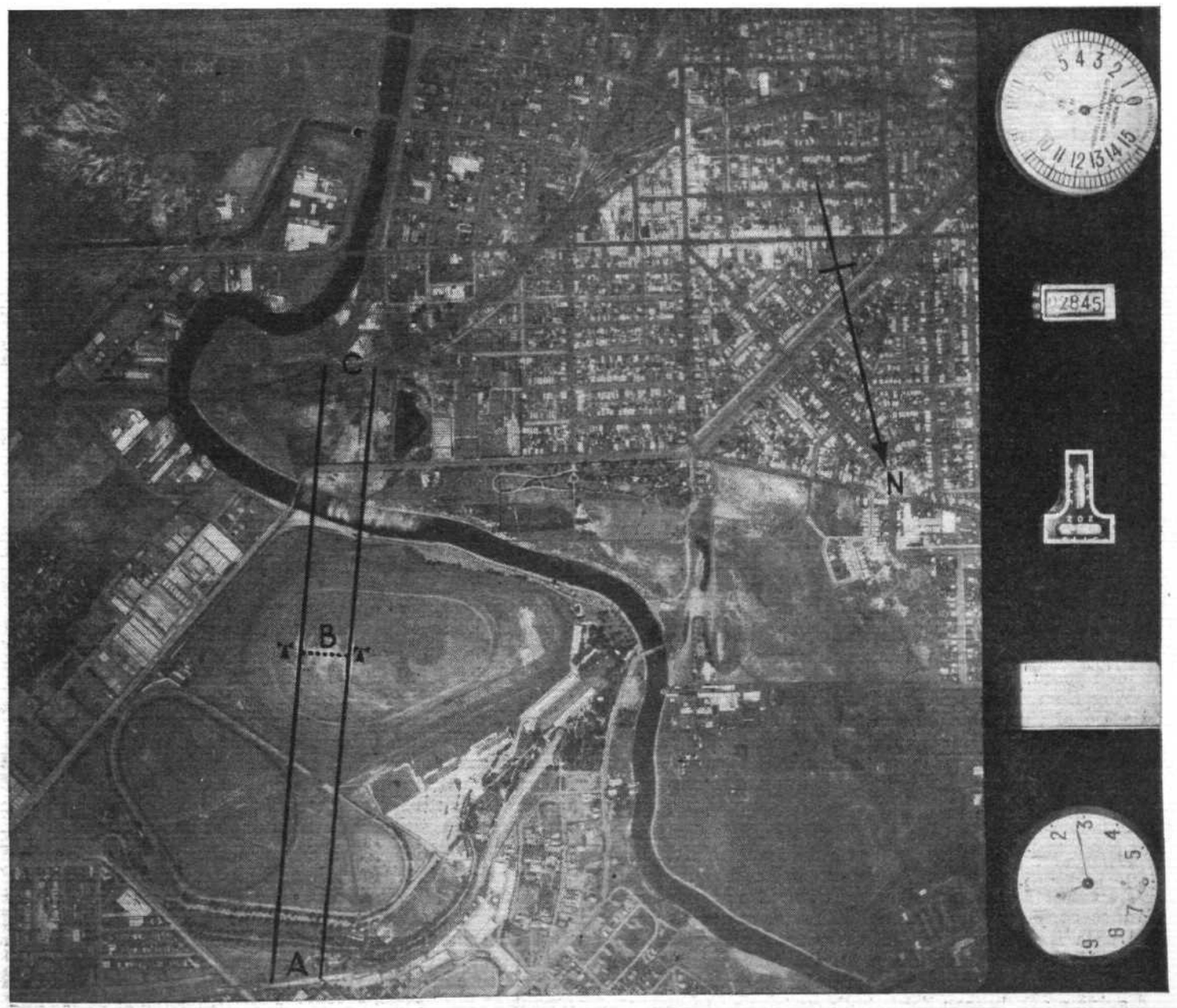
(1) The race must be of truly international character.

(2) Everything reasonable must be done to reduce the risk of accidents.

The committee, as originally formed, consisted of six members: Wing Com. Cole, Wing Com. A. H. Cobby, the Controller of Civil Aviation, the British Trade Commissioner, the Dean of the Consular Corps, and the Secretary of the Associated Aero Clubs of Australia. Sq. Ldr. Knight was co-opted for legal drafting; Mr. W. E. Bassett (lecturer on aerodynamics at the University of Melbourne) for handicap formula; and Alderman Wootten, of the Centenary Council, for advice on finance. Sub-committees were appointed to deal, separately, with route, regulations, compiling information for competitors, finance, control, and receptions, the last of these being presided over by the Lord Mayor of Melbourne.

As its representative in England the committee appointed the Chief of Air Staff, Air Com. Williams, now back in Australia after a lengthy visit to select new equipment for the R.A.A.F. Air Com. Williams secured the collaboration of the R.Ae.C., which will control and conduct the race between London and Koepang. The Melbourne committee remains the sole governing body.

The fact that the Centenary Celebrations are under Government direction involved the committee in many complications and delays during the early stages of its work. There was, for instance, the matter of obtaining official concessions and permits for competitors to fly over nineteen foreign countries. In each case the committee made its request to the Council, the Council passed it on to the Premier of Victoria, the latter to the Commonwealth Prime Minister at the Federal capital (Canberra), who



THE GOAL: The finishing line will be on Flemington Racecourse, Melbourne, but competitors will not land there, but will proceed to Point Cook. Arriving competitors will come in over the Showgrounds Railway Line, marked by a row of close red lights at A, dive on to the finishing line at B, which will be bounded by pylons, and then climb out of the area at C, where a row of red lights will mark the South Kensington Railway Line. (*Royal Australian Air Force Official Photograph.*)

cabled it to the High Commissioner in London. From this end it proceeded, via Dominions Office and Foreign Office, to respective ambassadors, envoys, and *chargés d'affaires* in the countries concerned, to be passed, in turn, to the appropriate departments in each country. The replies went back to the Melbourne committee through the same circumlocutory channels.

In a comprehensive report to the Council, Wing Com-Cole refers, among many other matters, to the difficulty in drafting conditions for the Speed and Handicap races, chief of which was lack of precedent. "It was recognised," he states, "that whatever conditions were framed they would be subjected to severe criticism on matters of policy. For the purpose of safety, control was compulsory and stopping places were prescribed along the route. The main reason was to narrow the area of search in case of mishap. The choice of Charleville as a control point has been criticised, but the committee decided on it to compel aircraft to avoid the Central Australian Desert." It has been argued that the Charleville control is superfluous, and that an aeroplane which can fly 2,553 miles non-stop from London to Baghdad should be allowed to fly direct from Darwin to Melbourne, a distance of less than 2,000 miles. May I recall that in 1929 Kingsford Smith and three companions were lost for several days in North-West Australia, and that, although they were eventually rescued alive, another party which set out from Sydney to search for them were less fortunate.

Charleville Control Necessary

Central Australia holds many grim secrets. It is a locality to be avoided at night by international racing pilots who scorn the use of wireless equipment and frown on the regulation which compels them to carry an emergency water ration. Charleville was the original southern terminal of the Qantas service, which in 1922 started operations from Longreach. In 1926 the company obtained an extension to Normanton (Gulf of Carpentaria) in the north, and in 1929 to Brisbane on the east coast. Its final extensions, granted in 1934, are to Cootamundra (N.S.W.) in the south and to Singapore in the west.

For the benefit of competitors in the MacRobertson race, all Customs regulations have been waived, subject to foreign aircraft leaving Australia within three months of arrival. Health formalities will be brief. Examination at Darwin will occupy about three minutes. The one requirement, after "contact with the East," is a certificate of immunity from smallpox.

The Koepang-Melbourne route has been surveyed from the air. Ground arrangements have been finalised at all checking points and controls. The Naval Board is sending its supply ship, H.M.A.S. *Moresby*, to the Timor Sea on searchlight patrol. The garrison at Darwin will floodlight the whitewashed wall of the gaol. The local aerodrome has been enlarged for the safety of competitors landing at high speed.

Wing Com. Cole states that a careful estimate of the duration of the Speed race indicates that the winner will probably land at Darwin on the afternoon of Monday, October 22 (assuming departure from London on October 20), cross the Northern Territory, Queensland, New South Wales and Victoria during the hours of darkness (Australia knows neither twilight nor the Daylight Saving Bill), and reach Melbourne on Tuesday, October 23, before daybreak. Official reception is planned accordingly.

The chairman of the Air Race Committee sends us an advance copy of the Koepang-Melbourne route to which final data is being added before issue to all competitors as an aid to navigation (see p. 891). The map details a system of aerodromes, landing grounds, safety precautions, and guiding and beacon lights both on land and across the 512 miles of Timor Sea, where the light-path thrown from the *Moresby* will be extended by searchlights mounted on every available lugger and junk of the North-West pearling fleet.

For night-lighting of controls and checking points the committee has secured a large supply of portable searchlights, floodlights, beacons, neon tubes and kerosene flares, in addition to adequate stocks of red, white and green Verey cartridges for signalling.

Wing Com. Cole reminds us that the Northern route runs through Australia's most sparsely populated area. Covering 523,620 sq. m., the Northern Territory is five times as large as Great Britain and Ireland, and has a population (according to the latest census) of only 4,616, with a high percentage of aboriginals. It is devoid of engineering facilities, electric power and direct land-line communication. In many districts it is also short of water, food and accommodation. Aerodromes in the interior cannot be floodlit, but the committee has evolved a comprehensive system of kerosene-flare paths which will operate at Newcastle Waters, Cloncurry, Charleville and Narromine, and has prepared a separate chart of these for guidance of competitors. Another shows the system of communications between Singapore and Melbourne.

Communications and Lighting

In its report the committee states that, to decrease delay in reception, by overland telegraph, of messages regarding competitors' movements, it has arranged for the use of W/T stations at Darwin and Rockbank (Victoria). The latter is remotely controlled from Amalgamated Wireless headquarters in Melbourne. Intermediate stations will be manned by the R.A.A.F. Wireless Reserve. A mobile R.A.A.F. W/T station will be on duty at Charleville. At a cost of £1,500 to itself, but without charge to the committee, Amalgamated Wireless (Australasia), Ltd., has established direction-finding equipment at the Darwin, Charleville and Melbourne stations.

Marking and lighting the finishing-line on Flemington Racecourse has received special attention. Obstruction lights on the railways bounding the racecourse to north and south have been installed by the Victorian Railways Department. The finishing-line proper will consist of neon bars ground-sunk between two 6ft. illuminated pylons.

Various other arrangements completed by the committee, "but not itemised in the report owing to their comparative unimportance," relate to collection and transmission of meteorological data, instructions to control officers, and provision of interpreters. A special subcommittee has formulated a general scheme for reception of the winning competitor at Flemington Racecourse, and it is hoped that Prince George will be present.

In conversation with foreign entrants during a recent tour which extended to Scandinavia, and from correspondence with America, I have heard nothing but praise for the work of the organising committee. In many cases financial backing has not been forthcoming; in others there is uncertainty whether aircraft still under construction will be delivered on time. At least three American entrants who, according to "New York Correspondents," had withdrawn in disgust at the regulations, have since written me that they have every intention of competing; while a fourth, J. H. Wright, in a letter dated August 16, informs me that he is being helped to start in the race by the Utica Civic Flight Committee, which has just been formed to assist him "financially and in other ways."

The much-discussed matter of transport from America is in that country's own hands. More than two months ago the U.S. Navy Department was approached on the subject. It was asked to provide free accommodation in one of its aircraft carriers for all competing machines and their crews. This would solve the preliminary difficulty and expense of getting them across the Atlantic, packing, freight and insurance charges, and the labour of unpacking and reassembly in England. The proposal is still under consideration. As an international gesture there is much to recommend it.

(*News of entrants will be found on p.* 910.)

PRIVATE FLYING

A SECTION FOR OWNER-PILOTS AND CLUB MEMBERS

THE art of flying, simple in broad fundamentals, has always been subject to intensive research, and the aerodynamic properties of wing sections and airscrew design have involved very close application. Suitable power units, too, have called for the greatest technical and engineering skill. When, however, one comes to reflect on the suitability or convenience of minor controls and fitments, a good deal of criticism can be levelled at present-day machines, however excellent their flying qualities.

Inconsistencies in Design

HAVING done some long-distance flying recently on more than one type of machine, I have had opportunities of observing many features which might rightly be termed, in these days, anachronisms. A few of these unsatisfactory points might be dealt with here with advantage, for it is largely by drawing attention to such matters that improvement will be brought about.

NOTES by LORD SEMPILL A.F.C., F.R.Ae.S.

While designers and manufacturers have made wonderful advances they have, perhaps, in concentrating on essentials, tended to neglect those small refinements which mean so much to the owner-pilot of to-day. We no longer marvel at the aeroplane as such; its capacity we take for granted, and, in the circumstances, those features which are subsidiary to the main requirements naturally come more readily to our notice. In making criticisms of any kind we can never forget the technical efficiency which has made record flights possible on machines which have in no essential differed from those available to the public. These have demonstrated that, properly handled and maintained, the utmost confidence can be placed in the modern light aeroplane.

But less favourable aspects of aircraft sometimes appear in everyday use. The difficulties of starting, for instance, are an ever-present drawback, particularly to the lady pilot, and the necessity for swinging the propeller can never be reconciled with the present stage of progress. With the general appearance of the metal airscrew, starting by this means is not made more pleasant, as the sharp trailing edges can inflict a good deal of damage unless extreme care is taken. In any case, turning the airscrew over by hand requires both skill and strength.

In cold weather the position is even worse, and in this connection the disadvantage of the usual method of petrol supply might be mentioned. The structural design of certain machines leaves little facility for gravity feed, and it has, therefore, been found necessary to fit mechanical petrol pumps. This is, of course, a better method than the old practice of air-pressure pumps, but, as usually placed, it is almost impossible to manipulate them for starting purposes, and effect a start by swinging the propeller, without assistance.

On machines intended for the use of the owner-pilot it is most essential that one person should be able to get under way without help. This leads not only to the question of the simplification of the method employed on certain machines, but to the broad question of applying some kind of mechanical starting, not as an expensive extra but as a standard equipment. The aircraft owner of to-day certainly expects, and quite rightly, a standard of convenience similar to that taken for granted by the possessor of a car. It is not too much to say that, if an attempt were made by manufacturers to sell motor cars with the lack of refinement so common in the aircraft, they would be doomed to failure from the start.

The Enclosed Machine

THE cabin type of machine is coming more and more into prominence, and naturally appeals to those desiring utility under all conditions. In some of the most modern of these the windows, for example, leave a great deal to be desired, as they cannot be opened and shut easily, and sometimes cannot be managed at all without using both hands.

In one of the best single-engined cabin machines that I have been flying recently a sun blind is fitted over the top lights. In hot countries, especially, this is a very necessary fitment, but in this particular instance the guides for the blind, which run fore and aft in the roof, are so placed as to catch the pilot's head or hat whenever it is inclined to the right or left. Such an irritating detail is not only entirely unnecessary, but is extremely annoying and should never be tolerated. Then, again, some modern petrol taps, which are controlled from inside the cabin, are very hard to move, and it is impossible to see with any certainty whether they are off or on, although the makers generally fix in a prominent place before the pilot's eyes on the dashboard an injunction to make sure that the petrol is turned on before commencing a flight.

Another essential fitment which all machines, and particularly those of the cabin type, should have is a reliable windscreen wiper. Those who have used such a device will certainly not be without it.

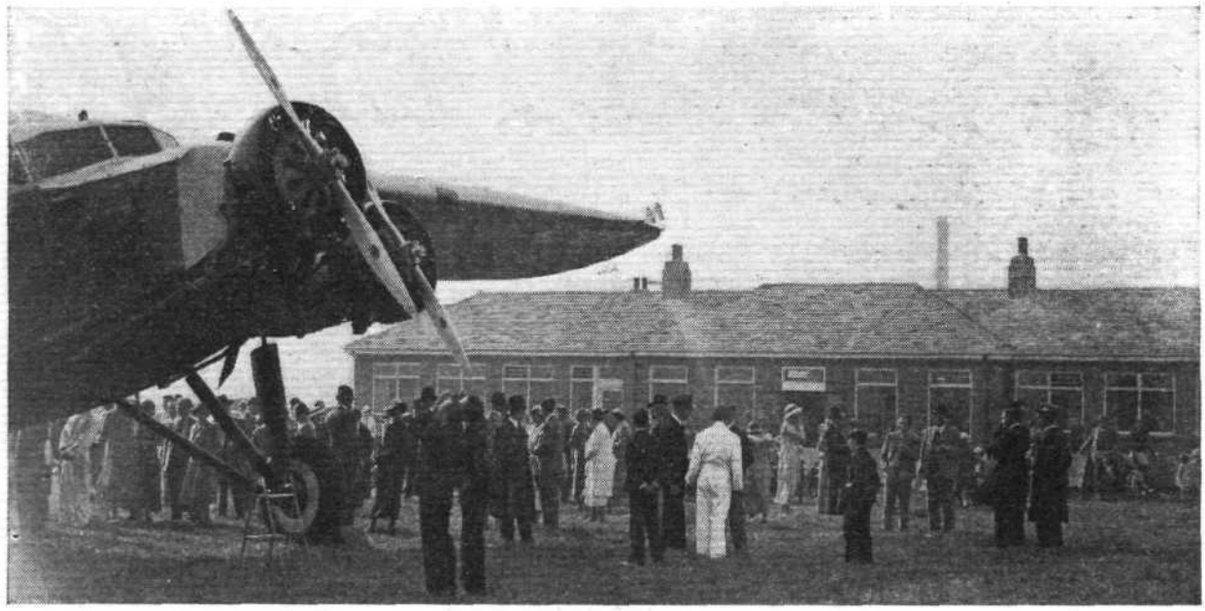
It is strange that the ordinary stick type of control is still used so largely. In the old days, when warping wings were general, a considerable amount of physical effort had to be applied to the stick, but this is a thing of the past, and, therefore, what is known as the spade-grip form of control will be found, certainly on long flights, infinitely preferable to the plain stick. The spade-grip control can be easily managed with one or two fingers of either hand, and allows for many convenient changes of position of the hand. In all normal conditions the control does not require to be firmly gripped as though it were a policeman's truncheon, but can be manipulated with the fingers of one hand. But this is so much a question of personal preference, and one knows of many pilots who dislike the spade grip.

The foregoing are a few of the details to which designers might well give more attention, for the time has arrived when flying is so essentially practicable that its devotees have a right to expect all the convenience and comfort to which they are accustomed in their motoring experience.

Private Flying

HOUSEWARMING AT SPEKE

The Inauguration of the Liverpool and District Aero Club's New Home at Speke Airport Last Saturday



The new clubhouse at Speke airport, with the Royal Dutch Fokker in the foreground, photographed during the opening ceremony. (*Flight* Photo.)

PLACED as it is on very slightly elevated ground alongside the River Mersey, and practically opposite the Hooton Aerodrome, which has been the Liverpool Club's headquarters for so long, the Speke Airport is not only excellent for its purpose, but it provides exceptional facilities for club flying.

Liverpool's Corporation has erected the new premises, together with ample accommodation, and leased them to the club, which thus obtains facilities and a headquarters which it could scarcely have hoped to attain by its own efforts.

The club-house is well built and appointed, with adequate kitchen and restaurant equipment. Lounge accommodation, pilots' room and offices are roomy, and there is all the car parking space that is likely to be needed. All is a part of, and yet nicely detached from, the main activity of the airport.

Saturday last was the day on which the club actively took over, and a very large gathering of friends met under ideal conditions, the occasion being under the patronage of the Lord Mayor of Chester and officials from several of the Merseyside authorities.

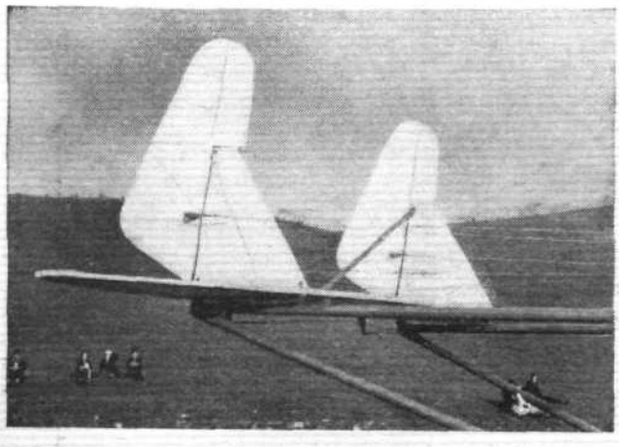
Many friends and members arrived by air, although all of them did not take part in the arrival competition, which attracted nine entrants, the result being:

	Error.
1. W. R. Massey ("Moth", Gipsy I), Brooklands 172 miles	5 sec.
2. Flt. Lt. R. C. Preston ("Moth" Gipsy II), Hornchurch, 180 miles	21 sec.
3. Miss M. Barnard ("Avro-Avian," Cirrus III), Woodford, 30 miles	7 sec.

One of the machines, the Beechcraft of the Vacuum Oil Company, piloted by Mr. H. J. White, was the centre of interest for some little time and, later, it was demonstrated. Maj. R. H. Thornton, chairman of the club, who acted as announcer, calling attention to its ability to fly slowly, to its acceleration and high cruising speed.

Unfortunately, the Autogiro demonstration did not take place, the machine not being available. Hard work also was put in to secure entries on the spot for a landing competition, but modesty proved stronger than the cajoleries of those who had the matter in hand—to their relief, apparently.

Before taking tea the gathering was entertained by Flt. Lt. Geoffrey Clapham, the club instructor, in the club Hermes-Avian, with a display of aerobatics, and by S. A. Thorn, of Henlys Ltd., who flew an Avro-Tutor for the most part upside down.



These views of the *Dunstable Devil* were taken at the Dunstable ground of the London Gliding Club. The machine is the property of Mr. D. G. Hiscox and Mr. A. G. Bolton who were helped by Messrs Noble and Collins with its construction. The two rudders can be opened outwards simultaneously to act as an air brake for landing.

FROM THE CLUBS

Events and Activity at the Clubs and Schools

RANGOON

The appearance of monsoon weather conditions during July reduced the flying total at the Rangoon Flying School at Mingaladon aerodrome, but eleven pupils flew solo, and one qualified for an Indian "A" licence. Two new pupils have joined the school.

CAMBRIDGE

Gales and high winds during the first part of the week made solo flying by pupils at Marshall's Flying School impossible, but the weather improved later and the instructional machines were kept very busy. Mr. E. Longley made a first solo flight in England, having recently returned from Canada.

CARDIFF

Night flying took place last Friday night at the Cardiff Aeroplane Club, and it is intended to make this a regular feature of the club's activities. Flying amounted to over three hours, and members are very enthusiastic.

The monthly landing competition held on the same day was won by the chairman, Capt. W. R. Bailey.

BRISTOL AND WESSEX

The Earl of Shrewsbury and Mr. Bergstrom made first solo flights at Whitchurch during the week. Lady Blanche Douglas, who recently learnt to fly with the Bristol Club, has purchased a "Gipsy Major" Miles "Hawk," and intends to fly to India in this machine next November, accompanied by F/O. C. V. Ogden, who is assistant instructor to the Bristol Club.

NORTH STAFFORDSHIRE

July was the first complete month during which the North Staffordshire Aero Club has operated its own aircraft, and flying hours totalled forty-six.

Visitors to Meir aerodrome during July included H.R.H. Prince George in a "Dragon." The club "Hawk" was flown to Limoges by Mr. S. Hawley at the beginning of August, a return being made via Ostend.

BROOKLANDS

Three members have put the larks to shame in their enthusiasm for early morning flying, and the roll of pupils increased by seven last week. An old pupil, Mr. S. S. Daniels, has returned after five years to take his 2nd class navigator's ticket.

Cross-country flights included one by Mr. Raymond Quilter and Mr. Fairlie, to Copenhagen, to demonstrate the G.Q. parachute.

LINCOLNSHIRE

At the Aero Fair and Gala next Saturday at Waltham aerodrome numerous ground attractions are being worked in with the aerial events in order to attract other than air-minded people.

A good entry is expected for the sixty-mile air race, and pilots who have not fixed up to go to Lympne will be heartily welcomed. Entries for the race will be accepted up to the day before, and a form will be sent on request.

NORFOLK AND NORWICH

Half the flying last week at Norwich was contributed by the boys attending the Public Schools Aviation Camp, and one more has soloed. Last week the boys had a lecture from F/O. A. J. S. Morris on compasses, further coaching from Mr. H. Birchall for their oral examinations, and made a tour of Messrs. Boulton and Paul's Works. Mr. H. C. Harrison, the winner of the scholarship presented by Mr. J. Carter, the general manager of Messrs. Boulton and Paul, passed his licence tests last week.

CINQUE PORTS

With the advent of three full-time instructors on the staff, flying times have improved considerably. Last week the total hours flown were over 70, Friday alone contributing 21 hours.

Further events for the International Meeting next week-end include demonstrations by that well-known German aerobatic pilot, Herr Emil Kropf, flying a Focke-Wolf "Stieglitz," while the total number of entries for the Folkestone Aero Trophy and the Cinque Ports Wakefield Cup Races are, to date, 47.

HATFIELD

Owing to the very gusty weather, the flying time last week was only 57 hr. 10 min. at the London Aeroplane Club. No machines flew at all on Monday and Tuesday, and cross-country flights were, for the most part, carried out during the remainder of the week. A new "Tiger Moth," fitted with night and blind flying instruments, has been added to the fleet, which now numbers seven.

Entries are being received for the competitions, and, judging by the number to hand, these competitions are going to prove very popular.

READING

Some twenty-five members of the International Friendship League were entertained to tea at the club last Saturday. There were members from Holland, Belgium, S. Africa, France, Norway, and Sweden. A draw was made during the afternoon, and ten of them were taken for pleasure flights during the evening by Messrs. Swann and Bishop in their "Moth."

The Reading Aero Club is arranging a party for Sunday, September 16. There will be arrival prizes for both aeroplanes and motor cars, and, among other entertainments, there will be a treasure hunt, a swimming party, and tea dance.

LONDON GLIDING

The outstanding event of Sunday, August 19, was the first test of the *Dunstable Devil*, a new type, which is the fourth machine to have been designed, built and flown by club members. Two more are nearing completion. The machine is a strut-braced, high-wing monoplane, with a monocoque nacelle for the pilot, the tail being carried on outriggers. Twin rudders are fitted and are designed to act as air brakes when both rudder pedals are depressed simultaneously. After three preliminary "hops," it was launched from the top of the hill, with Mr. Hiscox, its designer, as pilot. The pilot demonstrated its "hands off" capabilities en route.

In the afternoon a large crowd of spectators were particularly delighted with a flight by Mr. Collins in the *Rhonadler*, when, in a flight lasting only 20 minutes, he climbed to 5,000 ft., looped ten times, and landed. For a period of almost eight minutes his barograph recorded a climb of over 500 ft. per min.

Owing to the rapid progress made during the last few weeks, there are now a limited number of vacancies for new members, and application forms can be obtained from the Secretary, London Gliding Club, 13, Victoria Street, S.W.1 (Victoria 9153).

A New School in Worcestershire

Everything from an "A" licence to a G.A.P.A.N. instructor's Certificate course can be obtained at the Worcestershire Flying School, operating from Tilesford Aerodrome, Pershore, Worcestershire. Flying Officer James Bunning, R.A.F.O., is the Principal, and an aerodrome club is run at Tilesford House, an Elizabethan farmhouse, where full accommodation is provided for resident pupils.

The subscription is only £1 1s. per annum, there is no entrance fee, and the rates for dual and solo flying are 40s. and 30s. an hour. Boarding at the clubhouse is either £1 10s. or £2 a week, according to the length of stay.

F/O. Bunning has had seventeen years' flying experience, and has been Chief Instructor at the Northants Aero Club, the Norfolk and Norwich Aero Club, and the Cardiff Flying Club, apart from his Service experience.

A Misr Airwork Formation

Preparations are being made for a formation flight from Cairo to Baghdad in October to see the England-Australia race. It is hoped that three or four machines, piloted by pupils of the Misr Airwork School, will undertake the trip.

Mr. A. D. Carrol, the chief instructor, now gives instruction at Port Said aerodrome on two days in the week.

To Hungary

In connection with the Magyar Air Picnic, Aircraft Exchange and Mart, Ltd., are organising special trips to Hungary, and we understand that there are still seats available in either the "Puss Moth" or the Airspeed "Courier." Between September 15 and 21, 2,500 miles will be flown, and the return fares are £17 10s. for the "Puss Moth," and £22 10s. for the "Courier."

THE INEFFICIENT HEAT ENGINE

Is There an Alternative?

By W. O. MANNING, F.R.Ae.S.

The Author of these Notes is one of the Pioneers among British Aircraft Designers.

WHEN our grandchildren look back and contemplate the progress made in the mechanical arts of the present generation they will find without doubt very much to admire, but it is not unreasonable to suppose that they will be astonished at the complacency with which we regard our very inefficient methods of producing power by means of heat engines.

The usual prime mover, as exemplified in an ordinary petrol engine, may be roughly defined as an apparatus which converts the energy derived from an exothermic chemical reaction into motive power. The term exothermic means that the process produces energy in the form of heat, as in the case of the burning of a lump of coal, but it sometimes happens that the energy produced by such a reaction may be made to appear in some other form.

It is a characteristic of most of our existing prime movers that they convert the chemical energy derived from the chemical substances they use first into heat and then into motive power. The first of these processes can be carried out with a very high efficiency, but the efficiency of the second is limited. Taking concrete figures, the conversion of chemical energy into heat can be done with an efficiency of nearly 100 per cent., but the using of this heat energy to produce motive power cannot be effected with an efficiency greater than about 45 per cent. as a maximum, and there is little likelihood of this figure being improved. Actually, this figure of 45 per cent. has only been approached by a few special engines of the internal combustion type, and is considerably higher than the figure obtained on engines in practical use.

It is not proposed here to discuss the reasons for stating that this figure of 45 per cent. is not likely to be improved, as the arguments can be found in any text-book dealing with the thermodynamics of heat engines. But this low efficiency is connected definitely with the production of heat as part of the process of energy conversion, and there is no theoretical reason why it should not be increased to any figure less than 100 per cent. if some other process of conversion, not using heat, could be found.

No other process of producing power in the quantities required for, let us say, aircraft is known, and there is no possibility in sight of being able to obtain the power required in any other way, but it seems that the intrinsically low efficiency of the heat engine must lead to this type being eventually abandoned.

There are other ways of obtaining motive power from chemical energy, some of which are in extensive use on a small scale, and it seems worth while making a general survey of them, as it is not unlikely that among them may be found the germ of the future process of power production.

Let us take first the motive power produced by animals with the aid of muscles. The source of this energy seems to be the breaking down of a carbohydrate called glycolin in the muscle, with the production of carbon dioxide and lactic acid. This process is an exothermic chemical reaction and it is not yet fully understood, but it seems clear that the production of lactic acid in quantities greater than the blood can remove causes accumulation of this acid in the muscles, and gives rise to the sensation of fatigue. According to those who have studied this subject, the thermal efficiency of the process is about 25 per cent. without counting energy used by the breathing muscles and the heart, etc., so that the net efficiency is certainly less than this figure. It seems that a great deal of the loss is due to internal friction in the muscle itself owing to the viscous material with which this organ is formed. It follows, therefore, that the thermal efficiency is greater when the movements are slow rather than fast. Apart from any question of the difficulty of carrying out such a process mechanically, it would seem that the efficiency to be expected is less than that attained by an ordinary heat engine of the internal combustion type, so that any attempt to imitate this method of power production is not worth while.

It is possible in certain cases to make the energy produced by an exothermic chemical reaction reappear in the form of electricity instead of heat, and if this could be done with the chemical substances normally used for power production, there would be a considerable advantage in the process provided that the chemical energy could be converted into electricity with a high efficiency. This arises from the fact that the electric motor is a highly efficient piece of apparatus, and in the sizes that would be suitable for aircraft, an efficiency from electricity to rotary power of 90 per cent. could be attained without difficulty. Unfortunately, there is no known means by which the energy given by the chemical combination of the oxygen of the air with the hydrocarbons used as fuel by aircraft engines can be converted directly into electricity. If we split the hydrocarbon into carbon and hydrogen, we are somewhat better off, as it is quite possible to produce electricity from the combination of oxygen and hydrogen on a small scale in the laboratory, but this cannot be done with carbon and oxygen.

In the well known gas cell due to Sir W. Grove, oxygen and hydrogen are contained in two test tubes inverted and partly immersed in acidulated water. Into each of these test tubes platinum wires are fused reaching down to the water. This apparatus will produce electricity directly from the combination of oxygen and hydrogen, and the test tubes will slowly fill with water as the gases are used up, and by supplying oxygen and hydrogen to the two test tubes the production of electricity might be continued indefinitely. The efficiency of this process is high, possibly over 90 per cent., but it has so far been operated only on a minute scale. Even if it could be done on a large scale it would be impracticable, as pure hydrogen is hardly suitable as a commercial fuel. But at the same time the process may contain a germ capable of immense development.

This process of the production of electricity by an exothermic chemical reaction is that used in the ordinary primary battery used in electric torches. Of these there are many types, but the commonest is that producing zinc sulphate by the combination of zinc and sulphuric acid. The voltage produced by this method is almost exactly that which is expected from theoretical considerations, hence, when small currents are taken from the cell, so that the loss due to high internal resistance is negligible, the efficiency of the energy transformation is close to 100 per cent. But it is obvious that the use of zinc and sulphuric acid is impracticable for power production on a large scale.

We have therefore got back to where we started, that there is no known method other than by the use of a heat engine, whereby the power required for the propulsion of an aeroplane can be obtained, but it is clearly possible to obtain energy in the form of electricity from certain exothermic chemical reactions, and the question arises as to why this cannot be done in all such cases, especially with regard to carbon and oxygen. Theoretical considerations indicate that the voltage from such a reaction should be low, and it is probable that appropriate conditions may require the discovery of a new principle, but there is a large reward waiting for the successful inventor who can produce an apparatus which will solve this problem. The use of fuel oil in anything resembling a primary battery would appear to be still more difficult, but even that may be solved one day.

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THE AUTOMATIC CONTROL OF AIRCRAFT

By G. R. M. GARRATT, M.A., (Cantab.)*

(*Continued from page 52*)

General Construction of Automatic Pilot

The general construction of the Mark 1 Rudder and Elevator Control is shown in Figs. 5, 6 and 7. Fig. 5 shows the actual gyro rotor A mounted on its ball bearings in the inner gimbal ring B. The inner gimbal ring is mounted in pivots in an outer ring C, which is carried by vertical pivots in the supporting framework, which may be seen in Figs. 6 and 7. On the rotor spindle may be seen a pair of nuts D. These nuts, which will be referred to later, are for the purpose of balancing the rotor in "azimuth." The air supply for driving the rotor, which revolves at a speed of 11,000 r.p.m., is led to the bottom pivot of the outer gimbal ring. This pivot is hollow and from it the air passes through a pair of pipes, which are embedded in the vertical ring, to the two jets located close to the pivots of the inner ring.

Attached to the inner and outer gimbal rings are various valves and links, which may be seen in Figs. 6 and 7. These associated mechanisms are of a somewhat intricate nature and will be described in detail in their correct sequence later in this paper.

The construction and assembly of the gyro rotor in its bearings, and of the two gimbal rings with their respective pivots is of the very utmost importance, and only the highest degree of workmanship may be permitted in order that bearing and pivot friction may be reduced to the absolute minimum. Any friction about either the horizontal or the vertical pivots causes inaccurate behaviour of the controls.

It will be seen that the gyroscope is given three degrees of freedom, i.e., it spins about its own axis, and it is entirely unrestrained about both the pitch and azimuth axes. Bearing in mind, therefore, that the dynamic stability of the gyroscope tends to maintain the direction of its axis fixed in space, it will be realised that when any deviation of the aircraft occurs, a relative movement takes place between the supporting framework and the gimbal rings. The gyroscope is installed with its axis approximately in the fore and aft line of the aircraft, and thus a pitching of the aircraft causes a relative movement between the supporting framework and the inner gimbal or pitch ring, while a yawing movement causes a relative movement between the supporting framework and the outer gimbal or azimuth ring.

It is solely the relative movement between the outer gimbal or azimuth ring and the aircraft itself which controls the application of rudder angle, and the operation of the rudder control will therefore be considered first.

Rudder Control

When the aircraft deviates from i s course, the relative movement between the azimuth ring of the gyroscope and the supporting framework brings a small air valve which

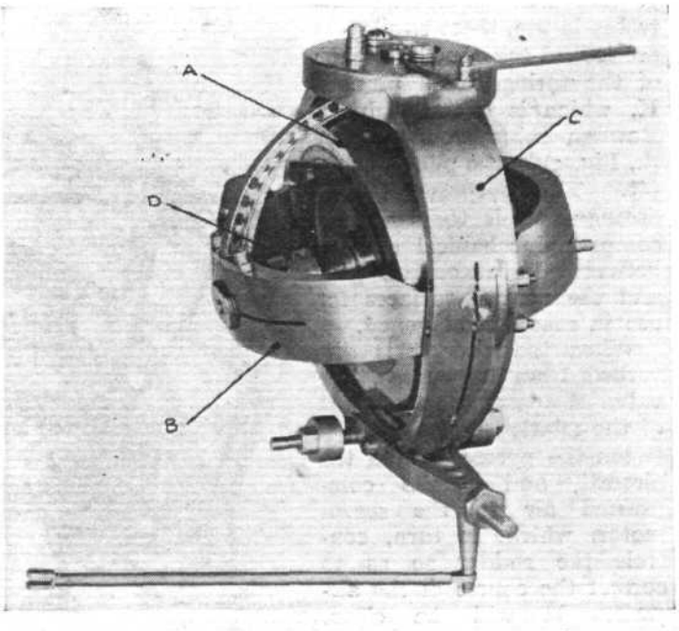


FIG. 5.—View of Gyroscope dismounted, showing inner and outer Gimbal Rings.

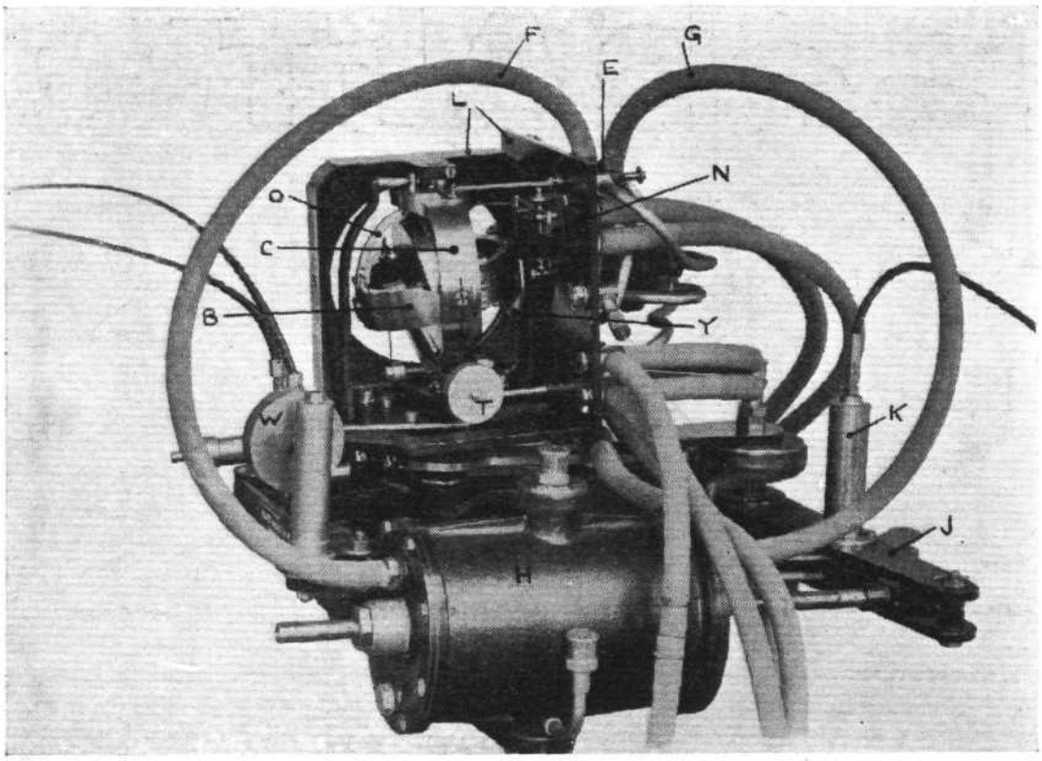


FIG. 6.—Rudder and Elevator Control from right-hand side, showing Rudder Control Mechanism, Course-change Cylinder, etc.

may be seen at E, Fig. 6, into operation. The piston of this valve is connected by a link to the azimuth ring (see photo.), while the valve body is carried on the framework. Movement of the piston in one direction or the other admits compressed air to one or other of the flexible pipes F, G, which lead to a double-acting servo-motor H. The piston of the servo-motor is connected by its rod to the dummy rudder bar J, which is connected by cables to the rudder of the aircraft.

It will be noticed that the servo-motor piston rod is actually connected to a lever which is pivoted about the same centre as the dummy rudder bar, and which can move independently between the top and bottom members of the rudder bar. This may be more clearly seen in Fig. 7. When the automatic control is in use, these two levers are locked together by means of the spring-loaded plunger K, which is operated by a Bowden cable from a lever (k, Fig. 2) in the pilot's cockpit. The purpose of this arrangement is to provide a complete mechanical cut-out between the automatic gear and the control surfaces for use in case of emergency.

When the aircraft is disturbed from its course, the valve E operates on account of the relative movement between the gyroscope and the aircraft, and admits compressed air to the servo-motor, which, in turn, controls the rudder so as to correct the course of the aircraft. It will be clear, however, that unless some means were adopted to control the movements of the servo-motor, the piston would travel to the extremity of its stroke and thus apply full rudder angle irrespective of the amount by which the aircraft had deviated from its course. Such a control would cause the motion of the aircraft to be continually disturbed and would be quite impracticable.

To achieve smooth operation of the control, it is necessary to arrange the mechanism so that the application of rudder angle varies proportionately with the angle through which the aircraft has departed from its course, and thus, as the aircraft returns to its course, the angle is progressively reduced. This requirement is satisfied by the incorporation of a "follow-up" system, by the action of which the movement of the servo-motor piston causes the rudder valve E to "follow" the movement of its piston and so limit the travel of the servo-motor piston to an amount determined by the actual displacement of the rudder valve piston. This will be more clearly understood by the following description.

The supporting framework L is not rigidly attached to the baseplate, but is carried on a bearing which permits a small amount of rotation about a vertical axis. The framework is connected by a pair of levers (which may be seen at M, Fig. 9) to the rudder bar. When the rudder bar moves, the gyro framework, together with the body of valve E, rotates slightly on its bearing in such a sense as to follow the travel of the piston and close the valve.

Suppose that the aircraft has received a disturbance,

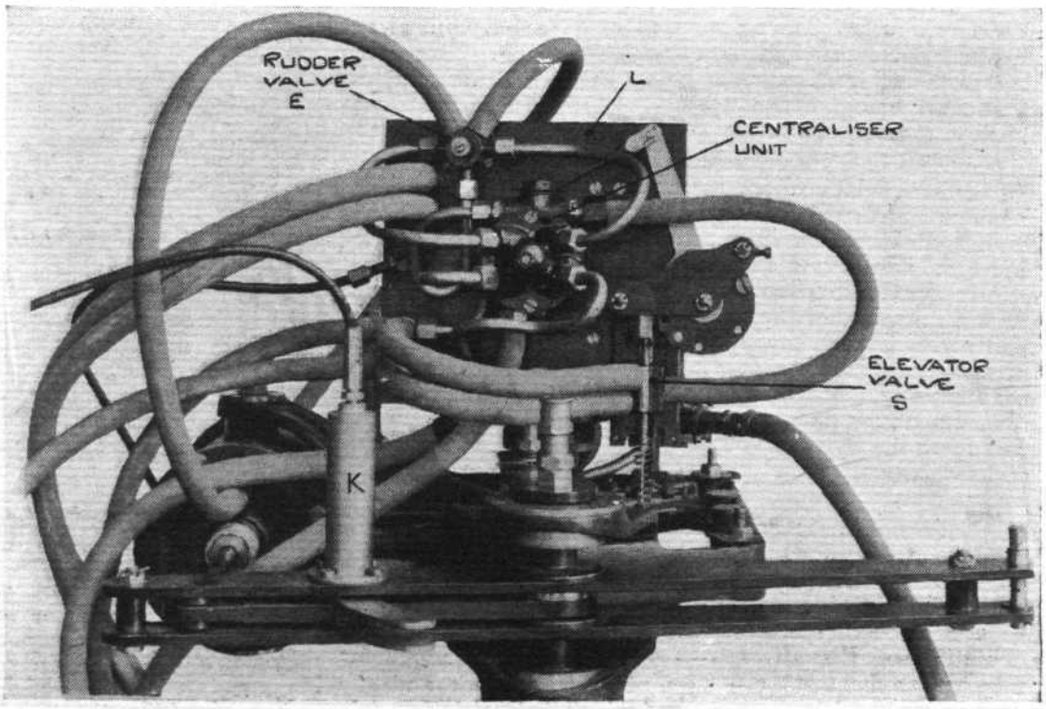


FIG. 7.—Rudder and Elevator Control from Front End, showing Centraliser Unit, and Rudder and Elevator Valves.

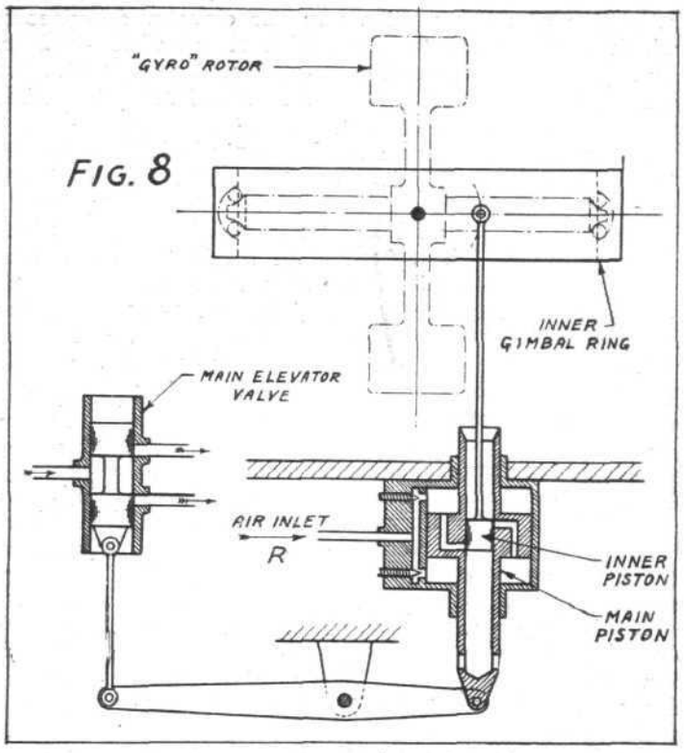


FIG. 8.—Diagram showing Operation of Relay Valve.

and in consequence has departed from its course. The gyroscope and the gimbal rings will remain "fixed," and relative movement will occur between the gyroscope and the supporting framework. This will cause the rudder valve to operate and, in consequence, compressed air will be admitted to one side of the rudder servo-motor. The servo-motor piston will therefore operate the rudder bar to apply a correcting movement to the rudder. As the rudder bar moves, however, the ratio levers M,M, cause the supporting framework of the gyroscope, together with the casing of the rudder valve, to rotate slightly in the same direction as the apparent displacement of the rudder valve piston. The rudder valve is thus closed, and, in consequence, no further movement of the servo-motor piston and no further application of rudder angle takes place.

By adjusting the effective lengths of the levers M,M, it is possible to regulate the magnitude of the rudder correction applied for a given departure of the aircraft from its course.

As the aircraft returns to its course, the rudder valve causes the servo-motor to reduce progressively the applied correction until the aircraft is again on its true course, when the rudder will be in the neutral position. In practice the aircraft usually "overshoots" the true course slightly, to which it returns by a diminishing oscillation.

The accuracy with which the Automatic Pilot maintains the aircraft on its course is in no way effected by any inherent tendency of the aircraft to yaw off its course, since the mean position of the rudder is automatically kept at the requisite position for straight flight in much the same manner as a pilot frequently has to keep the rudder applied if he wishes to fly straight.

Change of Course

There are two possible methods of altering course on a gyroscopically-controlled aircraft. The first is to change the relative positions of the gyroscope and the aircraft. While this method has the advantage of accurately measuring the amount of the turn, it possesses several serious practical disadvantages. The second method has been adopted in the Automatic Pilot, and consists in precessing the gyroscope itself, and since the aircraft is controlled by the position of the gyroscope, it automatically changes course as the gyroscope precesses.

From the brief description of gyroscope theory earlier in this paper, it will be recalled that in order to precess a gyroscope about the vertical axis, a torque must be applied about a horizontal axis at right angles to the axis of the rotor. This torque is actually applied to the inner ring of the gyroscope by means of a small double-acting air cylinder, which may be seen at N, Fig. 6, just beneath the rudder valve. The piston of the air cylinder is connected to the inner gimbal ring by means of a link and the perforated arm O. When air is admitted to one side or the other of the course-change cylinder, the thrust of the piston applies a torque about the horizontal gimbal axis and so causes the gyroscope to precess in azimuth. The admission of air to the course-change cylinder is controlled by the "Course-Change Cock" (g, Fig. 2) which is under the control of the pilot.

Balancing for Azimuth Accuracy

The accuracy with which the Automatic Pilot keeps the aircraft on the predetermined course is adjustable by means of the rotor nuts shown at D, Fig. 5. By means of these nuts the position of the centre of gravity of the gyro rotor and inner gimbal ring may be adjusted so that a negligible torque is exerted about the horizontal pivots of the inner gimbal ring. It is possible to adjust these nuts so that the aircraft will not deviate from its course by more than four or five degrees per hour.

Pitch Control

As will be realised from the earlier description of gyroscopic theory, a frictional torque about the horizontal axis of the inner gimbal ring will cause a precession of the gyroscope in azimuth. In other words, any friction about the horizontal pivots will be detrimental to the accuracy with which the Automatic Pilot can maintain the aircraft on its course. For this reason it is undesirable to connect the piston of the elevator valve direct to the pitch or inner gimbal ring, as, no matter how carefully the valve might be made, the friction between the piston and the casing would result in poor course-keeping qualities.

In the case of the rudder valve this friction is not of serious consequence, since friction in the rudder valve is

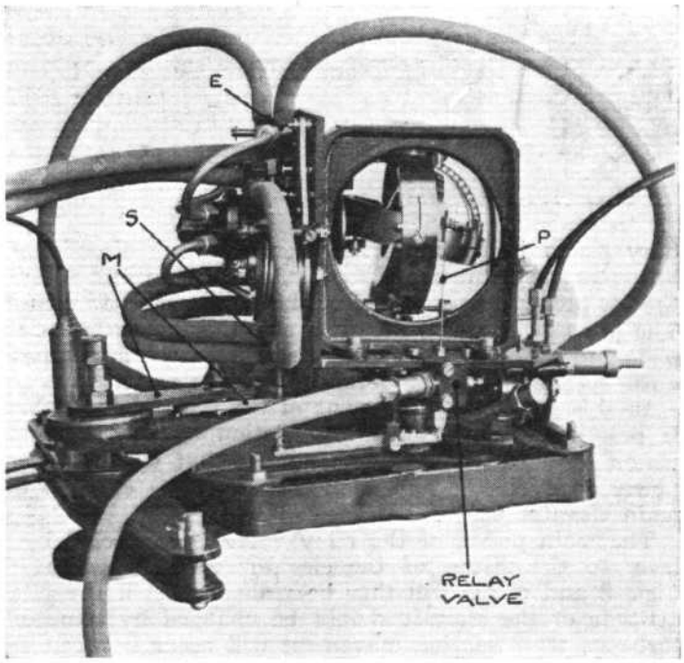


FIG. 9.—Rudder and Elevator Control from left-hand side, showing Connection between Pitch Ring of Gyroscope, Relay Valve and Main Elevator Valve.

equivalent to a torque about the vertical axis. This will cause certain errors in the pitch attitude, but, since the pitch attitude is accurately determined by gravitational means, as will be described later, small frictional torques about the azimuth axis can be tolerated.

In order to reduce the frictional torques about the horizontal axis, the inner gimbal ring is connected to the main elevator valve by means of a pneumatic relay valve, the construction of which will be made clear by reference to the diagram, Fig. 8. The small inner piston of the valve is connected to the inner gimbal ring by means of the rod which may be seen at P, Figs. 8 and 9. Referring to Fig. 8, which is diagrammatic only and inaccurate in detail, it will be seen that the inner piston moves inside a sleeve which forms part of the main piston of the relay. Small air passages are arranged in the main piston, as shown, one of which connects the top chamber of the cylinder with an exhaust port at the bottom end of the normal position of the "fairy" piston, and the other of which connects the bottom chamber with an exhaust port at the top of the fairy piston.

Air is supplied to the relay from an expansion chamber via the inlet R, and it then passes to the top and bottom chambers of the relay through the tapered needle throttles as shown.

In the neutral position, the fairy piston just covers the two exhaust ports of the main piston, and, since there is only a negligible leak through the ports, the air pressures on either side of the main piston are equal. When the

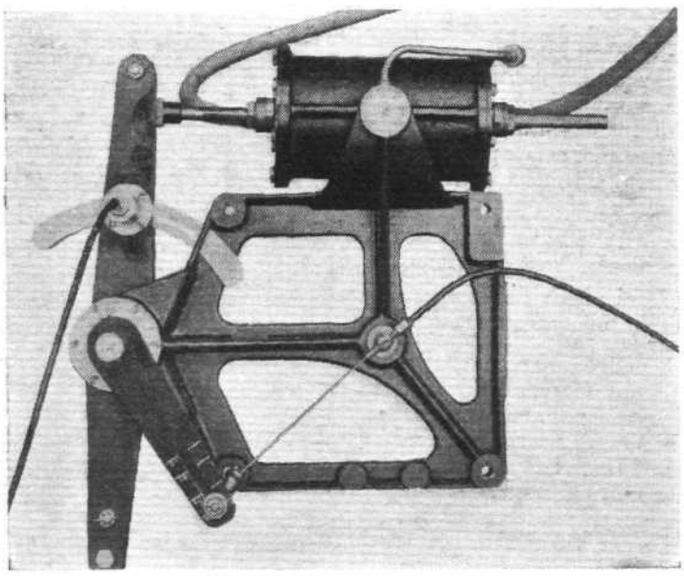


FIG. 10.—Elevator Servo-motor and Mounting.

fairy piston is displaced, however, in either direction, it uncovers one of the exhaust ports, and consequently allows the air pressure on one side of the main piston to escape. The pressure of air on the other side then causes the main piston to move in the same direction as the fairy piston until both the exhaust ports are again closed.

In this manner a movement of the fairy piston, which is practically unrestrained by friction, causes the main piston to move by the same amount but with sufficient power to overcome any friction which may exist in the main elevator valve.

The main piston of the relay valve is connected by a lever to the piston of the elevator valve shown at S, Figs. 8 and 9. It will thus be realised that if the pitch attitude of the aircraft should be changed by some disturbance then relative movement will occur between the pitch ring of the gyroscope and the aircraft. As a result, the fairy piston will be displaced, and, in consequence of the relay action of the fairy valve, the main elevator valve will be operated. The main elevator valve controls the admission of compressed air to the elevator servo-motor which is shown on the illustration of the elevator plate, Fig. 10. The servo-motor is connected to the elevator cables in a very similar manner to that already described above for the rudder control.

As in the case of the rudder control, it is necessary to use a follow-up system in order to ensure that the movements of the elevators are proportional to the amount by which the aircraft has been disturbed from its mean pitch attitude. The operation of the elevator follow-up system is controlled by a Bowden cable which connects the movements of the elevator servo-motor to the casing of the main elevator valve. When the piston of the elevator valve is displaced by the operation of the relay valve, compressed air is admitted to one side of the servo-motor, causing a movement of the servo-motor piston, and thus producing the application of elevator angle. As the piston moves, however, the Bowden cable mechanism causes the casing of the elevator valve to follow the displacement of its piston, thus closing the valve and preventing the further application of elevator angle. The angle through which the elevators are moved, therefore, depends on the actual pitch displacement of the aircraft.

It will be clear from the above description of the pitch control that the constancy of the pitch attitude maintained must depend solely on the accuracy with which the gyroscope maintains fixed the direction of its axis, and, since the constancy with which the gyroscope can define a pitch angle is affected by the rotation of the earth and by the frictional torques which must be present about the vertical axis of the gyroscope, it is essential to provide means for ensuring that the gyroscope will be substantially unaffected by such torques, and will be capable of maintaining a constant pitch attitude, in spite of a possible change of latitude or the rotation of the earth.

Adjustment of Pitch Attitude

In order to maintain a constant pitch attitude under all conditions, it is necessary so to control the gyroscope that its pitch angle remains constant with respect to the vertical. This is achieved by gravitational means.

The outer gimbal ring, which, it will be recalled, is carried by vertical pivots, is put out of balance by the addition of a weight T, Fig. 6. When the pivots are exactly vertical, it is clear that this lack of balance will have no effect whatever, but consider the effect of the weight if the line of the pivots should be tilted either forwards or backwards. The weight will then cause a torque about the line of the pivots, and this torque produces a precession of the gyroscope about the horizontal pivots of the inner gimbal ring. In other words, the gravitational torque about the outer gimbal axis when that axis is tilted results in a precession of the gyroscope in pitch. By means of the relay valve and the main elevator valve, the aircraft is constrained to follow the datum set by the gyroscope, as has already been explained. When the gyroscope is precessed in pitch, therefore, by the gravitational torque about the outer gimbal axis, the aircraft changes its pitch trim, and in doing so the axis of the outer gimbal ring is once again returned to the vertical, and the gravitational torque disappears. The pitch attitude of the aircraft is thus governed by the relation between the machine and the axis of the outer gimbal ring, and it would be possible to adjust the pitch attitude by varying this relationship.

There are, however, certain disadvantages to this method of adjusting the pitch attitude, particularly when the ailerons are uncontrolled, and another method is therefore adopted.

Countering or balancing the torque about the outer gimbal axis due to the weight T is a second torque which is applied to the outer gimbal ring through the lever U, Fig. 11. This lever is connected to one end of a coiled spring V, the other end of which can be rotated through

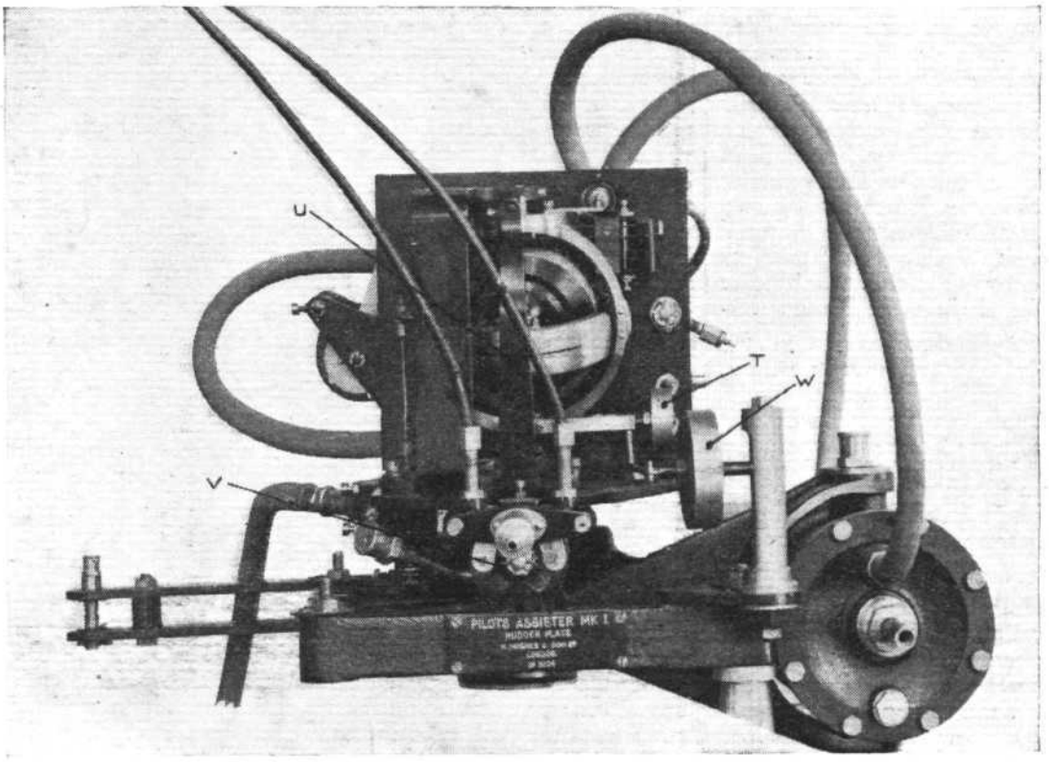


FIG. 11.—Rudder and Elevator Control from Rear End.

a small angle by means of a Bowden cable from the pilot's cockpit. The pilot is thus able to control the magnitude of the counteracting torque. Since the gyroscope must continue to precess in pitch so long as the two torques are unequal, it is clear that the normal pitch attitude of the aircraft is defined by the angle at which the gravitational torque exactly opposes the spring torque. When the pilot wishes to change his pitch attitude, he makes an adjustment to the spring torque, thus causing the gyroscope to precess and control the aircraft into a new attitude, at which the gravitational torque again balances the spring torque.

The Effect of Lateral Accelerations

It has been stated above that the outer gimbal ring is put out of balance by the addition of the weight T, Figs. 6 and 11, and while the addition of this weight alone would permit the gear to function as described, it would be sensitive to lateral accelerations, which would cause small inaccuracies in the pitch control when the axis of the gyroscope was displaced laterally from the fore and aft line of the aircraft, as will occur during a turn, or if a continual application of rudder is required to maintain straight flight.

In order to make the unbalanced mass, consisting of the outer gimbal ring and the weight T, insensitive to lateral accelerations, the weight is divided into two parts, one of which is attached to the outer gimbal ring, as shown at T, and the other of which is shown at W, Fig. 6. This second weight is carried by a pivoted arm which is connected to the outer gimbal ring by a link, the whole arrangement forming a "Watt's linkage."

This arrangement operates in exactly the same manner as the single weight described above, so far as fore and aft accelerations or pitch angle changes are concerned, but it has the advantage of insensitivity to lateral accelerations.

Tilt of Gyroscope Axis

When discussing the matter of stability earlier in this paper, it was stated that it had been shown both mathematically and practically that satisfactory damping of a disturbed motion could be obtained by the application of rudder angle in proportion to the roll displacement of the aircraft. A full explanation of the reasons for this would require mathematical treatment, and would be out of place in these pages. It will suffice here to state that the application of rudder angle when the aircraft is banked tends to increase the lateral stability in much the same way as if the ailerons were used to correct the bank.

Separate control of the ailerons would require the use of a second gyroscope with a consequent increase in the complexity and cost of the installation, and, except for certain special purposes, or in an aircraft having little lateral stability, control of the ailerons is not usually necessary.

Throughout the previous description of the Automatic Pilot it has been assumed that the axis of the gyroscope lies parallel to the fore and aft axis of the aircraft. It was shown by Meredith, however, that if the forward end of the axis is tilted slightly upwards, so that the axis of the gyroscope is no longer parallel to that of the aircraft, an application of rudder angle takes place when the aircraft is banked.

When the axis of the gyroscope is parallel to the fore and aft axis of the aircraft, it is clear that no relative motion can occur between the gyroscope and the aircraft,

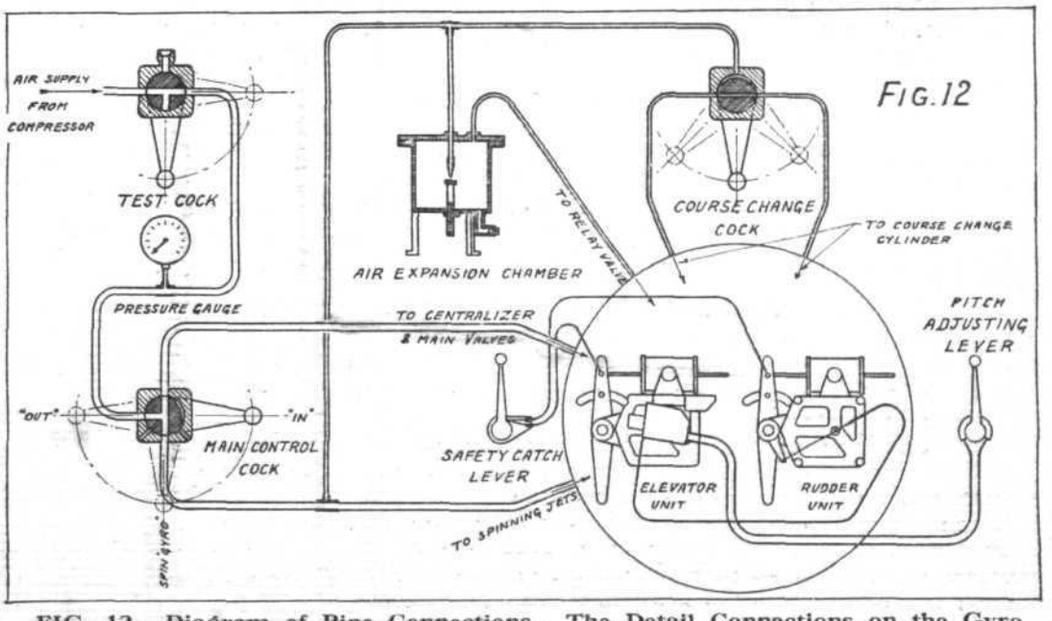


FIG. 12.—Diagram of Pipe Connections. The Detail Connections on the Gyro Mechanism have been shown diagrammatically for the sake of clarity.

if the latter is banked without either turning or pitching.

If, however, the gyroscope axis is tilted the relative motion which must occur between the gyroscope and the aircraft when the latter is banked will clearly have a component about the azimuth axis. This component of the relative movement serves to apply rudder angle by means of the rudder valve in exactly the same way as has been described for the rudder control.

The total application of rudder angle is thus seen to be the sum of two parts, one being determined by the azimuth deviation of the aircraft and the other being determined by the roll displacement.

Provided that the aircraft is reasonably stable in roll the damping of the disturbed motion of an aircraft fitted with gyroscopic control of rudder and elevators only is greatly improved by the tilting of the gyroscope axis. In such an aircraft it would only be necessary to control the movements of the ailerons if an improvement of the roll stability in rough weather were desirable, or if a highly accurate degree of stabilisation were required.

Preliminary Operation of Controls

While the foregoing description gives a complete picture of the operation of the gear while the controls are in use, there remain the preliminary operations and the apparatus connected therewith before the controls can be put into use.

Referring to Fig. 12, it will be seen that the compressed air, at a pressure of 30-35 lb. per sq. in., first passes a "Test Cock" (e, Fig. 2), and thence communicates with the "Main Control Cock" (f, Fig. 2).

The object of the Test Cock is to provide an easy connection for a compressed air supply for ground testing of the gear when the ordinary compressor system can obviously not be used.

The Main Control Cock has three positions, in the first of which the compressed air is completely cut off from the Automatic Pilot. In the second position the compressed air is connected to the spinning jets which play on the periphery of the gyro rotor. The gyroscope runs at a speed of 11,000 r.p.m., and an interval of at least five minutes must be allowed to elapse to allow the gyroscope to reach its normal speed before the controls are put into operation by moving the Main Control Cock to the third position.

Gyroscope Centraliser

In Fig. 7 may be seen the exterior portion of the Centraliser unit. This unit consists of a spring-loaded piston and cone. The cone may be seen at Y, Fig. 6. In the normal unoperated position this cone is pressed towards the gyroscope and engages with a pin on the inner gimbal ring, which is accurately located by the apex of the cone. The gyroscope and gimbal rings are therefore locked when out of use, and the risk of accidental damage to the bearings is minimised.

The centralising cone remains in the locked position while the gyroscope is being run up to speed, and so sets the initial position of the gyroscope when the controls are put into operation.

At the back of the centraliser (Figure 7) several pipes may be seen. These communicate respectively with the two ends of the rudder and elevator servo-motors and when the controls are not actually in use, all these four pipes are in intercommunication. The pistons of the servo-motors are thus free to move in their cylinders and offer no appreciable restraint to the free movement of the control column and rudder bar by the pilot.

When the main control cock is turned to the third or "In" position, the compressed air is connected to the pressure side of the centraliser piston which then compresses the powerful spring contained therein and withdraws the cone from the inner gimbal ring. The withdrawal of the cone and piston simultaneously seals the four communicating pipes from the servo-motors and supplies the compressed air to the various valves which thereafter control the air pressures in the respective servo-motors as has been previously described.

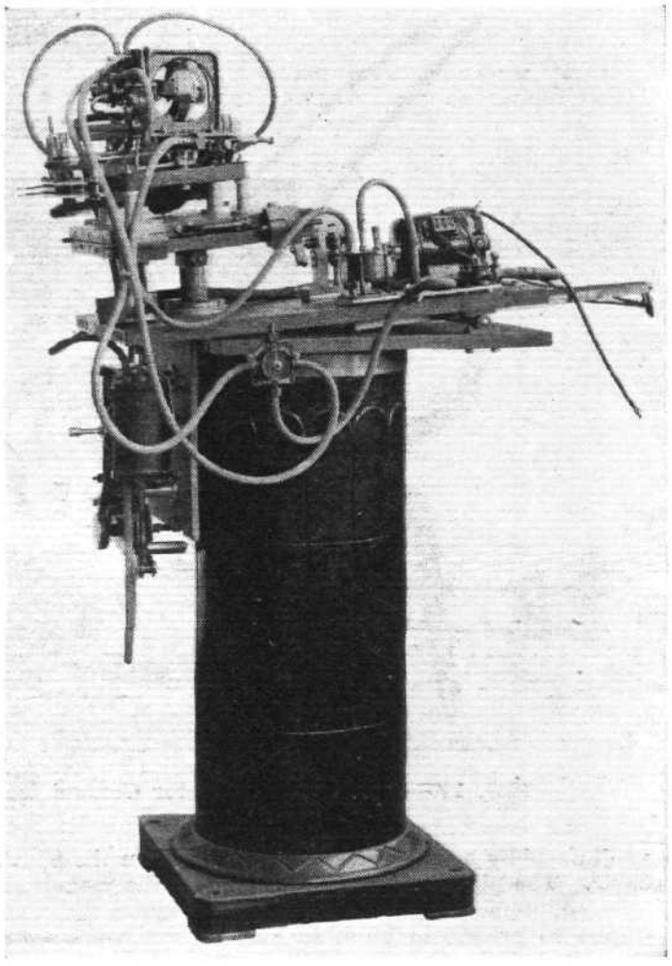


FIG. 13.—View of "Tuning Table" on which the various Adjustments and Balancing Operations are carried out. The Table can be oscillated in Pitch and in Azimuth by means of the Electric Motor. Complete Tuning of a Rudder and Elevator Control usually occupies between three and six days.

Conclusion

It is inevitable that with the extension of long distance air transport the use of automatic control will become universal. The relief which is afforded to the pilot by the use of the Automatic Pilot permits him to devote the greater part of his time to navigation, map reading, and the operation of his radio installation, whereas with manual control, his whole time is occupied with the actual flying of the aircraft.

Perhaps the value of the Automatic Pilot is most appreciated by a pilot who is compelled to fly under rough weather conditions, when visibility is bad and the control of the aircraft rendered difficult by the violence and frequency of the disturbances. Under such conditions the safety of the aircraft and the lives of the occupants depend solely on the skill and endurance of the pilot.

The navigation of an aircraft at night is never an easy matter, and the strain on the pilot whose duties compel night flying under all weather conditions often demands the utmost endurance. Assisted by the Automatic Pilot, his task is rendered far lighter, and provided there is sufficient visibility for taking off and landing, the dangers which are otherwise inevitably associated with night flying are reduced to a negligible quantity.

The Automatic Pilot can control the movements of an

aircraft far more accurately than the most skilled human pilot. It is important to remember that while a disturbance must actually have occurred before it can be appreciated and corrected by a human pilot, the Automatic Pilot detects a disturbance instantly with its growth and almost simultaneously applies the means for its correction. In consequence, the somewhat unpleasant motions of an aircraft in rough weather are very much reduced, and it is therefore probable that public opinion may, in the future, demand the universal use of automatic control in passenger carrying aircraft.

The accuracy with which the Automatic Pilot can maintain the aircraft on its true course must inevitably result in a reduction of the fuel consumption. In practice, the course steered will not deviate by more than four or five degrees per hour, and thus only a very occasional correction is required by the pilot.

The additional weight of the equipment is more than balanced on a long flight by the reduced fuel consumption and not infrequently the carrying of a relief pilot or wireless operator is rendered unnecessary.

In comparison with the extra safety assured, the economies and the extra comfort afforded, the initial cost of installation is not high. The considerable experience of the working of the Automatic Pilot which has been gained during recent years by its use in several squadrons of the Royal Air Force has demonstrated the safety and the value of the installation, and it is safe to predict that within a few years, no passenger or freight-carrying aircraft will remain unequipped with gyroscopic control.

NICKEL WIRE FOR SPARKING PLUGS

By A. G. AREND

NICKEL wire has been adopted as representing the most suitable economical metal for the sparking plugs of internal combustion engines. The intensely hot spark which is formed heats the zone around the gap to a very high temperature. Accordingly, nickel has been adopted as the most suitable metal for the central electrode points, whilst in many cases the side electrodes are stamped from nickel sheet to the required template. The successful manufacture of the nickel wire for this purpose has been the outcome of much research work, because nickel is one of the most impure metals on the market.

There are, of course, many classes of the metal, but to the present day it is quite customary to find nickel which contains several per cent. of impurities.

Such a metal as this is of little value for drawing purposes, and would only result in brittle and weak wire. It is thus recognised that only the purest form of nickel be used for wire drawing.

When it is known that the wire has to be ultimately used in the making of sparking plugs, an addition of about 2 per cent. of manganese is made.

This is better suited to withstand the effects of current and heat, but sometimes adds to the difficulties of successful drawing. The best nickel is obtained from the electrolytic process. This is first cut up into long strips which resemble ingots of small section. These are first hot-rolled, and later cold-rolled, until the section has been reduced to a thin rod. Heat treatment has to be performed between the different rolling operations to remove the strains which exist in the crystalline structure of the metal. Much more difficulty is experienced in this heat-treatment, than in the annealing of copper, brass or similar metals for wire production.

Brittleness appears during the reduction of the billet, before it has even reached the rod stage.

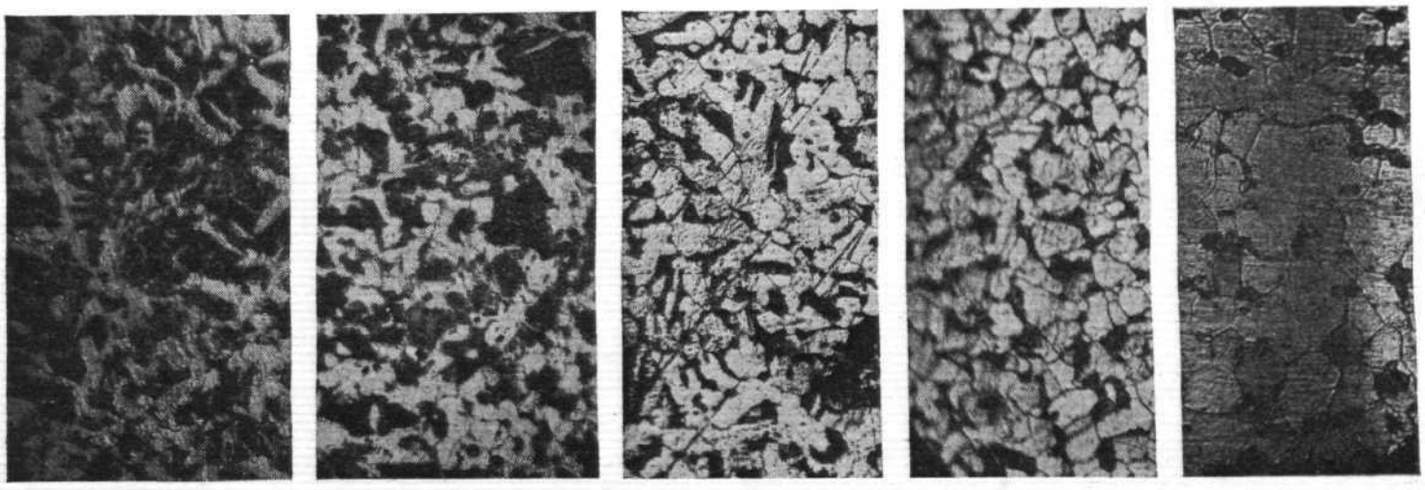
This is due to the ready solubility of nickel oxide in the nickel. The result is that to-day the pure metal from the electrolytic extraction, is not directly rolled, but first melted, and a minute quantity of a deoxidising agent added, which ensures the removal of this undesirable oxygen.

The metal is then poured into rod-ingot moulds, which thus economises in part of the rolling operations which would otherwise have been necessary.

The final size of the rod is about $\frac{1}{4}$in. diameter, after which it is reduced to the form of wire by drawing through dies. The drawing process does not differ materially from that adopted for the making of copper wire, since the relative ductility of copper and nickel are very similar. (These conditions, however, do not obtain in the rolling of the two metals as copper is much more malleable than nickel.)

Ductility simply signifies the power of the metal being permanently extended by traction, and although ductility and malleability are closely associated in most cases, an exception to this exists in the drawing of nickel and copper wire. The plant used for the making of the nickel wire is the same as that used for copper wire. The wire required for sparking plugs is expected to possess a fair amount of rigidity, since although the shape must be capable of being altered from time to time, it must remain in such a position.

The melting point of nickel is only surpassed by three



FIVE PHOTO-MICROGRAPHS: A specially-drawn Nickel Wire under different magnifications.

metals of ordinary commercial importance, which are cobalt, chromium and platinum, all of which are more expensive than nickel. There is thus little likelihood of a substitute being used in place of nickel at the present time.

Examination of the Electrode Points

The small section which the electrode point offers does not assist the examinations which take place.

When troubles are known to exist in the wire, a number of different nickel wires are removed from their respective sparking plugs. These are accurately ground and polished by a small machine specially adapted for the purpose.

The small section of wire is then etched by immersing in dilute hydrochloric acid for a few minutes.

It is then washed in water, dried, and carefully fitted in a mounting device with the assistance of some soft modelling clay and the etched surface examined under the microscope.

Different minute cracks are sometimes found to exist in the electrode points. This was only ascertained after a number of sparking plug wires had fractured after prolonged use. The microscopical examination revealed that these cracks were due to intercrystalline complications. They usually commenced from the outer skin of the wire and travelled inwards to the core of the wire. When substituting nitric acid for hydrochloric acid during the etching process, it was found that the former penetrated so rapidly that the crystal boundaries were impaired for examination, and that some of the grains fell out completely.

Some central electrodes taken from old plugs showed a similar surface change, but in the ordinary way transverse cracks were practically never experienced. The wire of the sparking plug is known to be exposed to a certain amount of stress, due to differential expansion of different parts of the plug, or to vibration caused by the ordinary working of the engine.

The same transverse cracks were practically never apparent in that class of plug in which bent side electrodes terminate in a point. It has been asserted that the chemical composition of the wire is unimportant, and that commercial wire will behave as well as pure nickel wire. This is scarcely accurate as it only alludes to those classes of wire to which manganese has been added. Many sparking plug electrode wires contain upwards of 3 per cent. of manganese, which neither impairs the electrical conductivity or heat-resisting properties, but this should scarcely be regarded in the light of impure nickel. The heating of this wire in air or oxygen differs from the conditions which obtain in the combustion chamber. When tests were first made on the wires, it was found by microscopical examination that the oxygen penetrated along the crystal boundaries. This formed a eutectic of nickel oxide which resulted in brittleness in the electrode wire.

In actual working practice of the plugs, this is not so important, since the conditions inside the cylinder are different. Carbon monoxide and acetylene are present in the latter, which are more effective, than air itself.

When the electrode points have been raised to a high temperature in these gases, intercrystalline brittleness is readily produced, and a fracture of the wire is always liable to result.

Overheating caused by the local action of a strong electric current, can result in similar circumstances, although this is quite independent of the oxidation. Irrespective of what the conditions are, nickel wire is always liable to fracture, even when exposed to a small load, at high temperatures.

A large series of tests were made in order to ascertain the relative strength of the wire at different degrees of heat. That is, the tensile strength was determined before being heated and then whilst the wire had been raised to the different pre-determined temperatures. The strength showed very clearly that it rapidly diminished, as the temperature rose, and in one extreme instance, it had fallen so far as 5 per cent. of the original tensile strength, whilst in the cold condition.

Some plugs are probably better insulated than others, whilst heating-up and vibration varies somewhat widely with different engines.

In practically all cases the breakages of the wire are due to the temperature, and the carbon monoxide and acetylene only act as secondary measures.

With most broken electrodes, the breakage took the form of intercrystalline fracture.

The conclusions which may be drawn from this are that the assembling of the sparking plug parts is not so likely to be responsible for a breakdown of the electrodes, as the method of production and preliminary heat-treatment of the wire. Further, nickel wire cannot recover in the ordinary way from the effects of overheating in a bad-working engine, and the strains are present in the wire and will develop to a fracture sooner or later.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any bookseller.

AILERON ANGLES IN HIGH SPEED MANŒUVRES WITH SINGLE SEATER FIGHTERS. By B. V. Williams, M.Sc., and J. H. Hartley, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1582. (8 pages and 6 diagrams.) September 11, 1933. Price 6d. net.

It was required to investigate by full scale experiments the movements of the ailerons on single-seater fighters during high-speed manœuvres, in order to provide data for the revision of strength requirements.

Synchronised records were obtained of aileron movement and air-speed in those manœuvres which required large aileron angles at high speeds. On Aeroplane "A" the R.A.E. and Service Unit pilots applied their controls with the maximum force possible, considerably in excess of the force used in normal service manœuvres. In the case of Aeroplane "B" the R.A.E. pilots applied their controls in a manner which they thought would cover most service contingencies, whilst a Service Unit pilot was asked to reproduce these manœuvres in the normal service manner.

The ailerons of Aeroplane "A" are so heavy that full aileron could not be applied at top level speed, whilst at high speed in the dive with engine throttled only a small movement of aileron can be obtained. It is possible to apply full aileron in an upward roll from a dive at 200 m.p.h., but this is because the speed has decreased below top level speed when the ailerons are applied.

On Aeroplane "B" full aileron would appear to be applied seldom at top level speed or higher speeds, but it might be possible to apply it at such a speed by the use of abnormal force. A considerable amount of aileron can, however, be used, at speeds well in excess of top level speed, when diving with engine throttled. In similar manœuvres at the same speed the Service pilot applied less aileron than the R.A.E. pilot.

EXPERIMENTS ON THE WESTLAND-HILL PTERODACTYL, MARK IV. PART I. EXPERIMENTS ON A 1/5 SCALE MODEL. By A. S. Batson, B.Sc. PART II. FULL SCALE TESTS. By J. E. Serby, B.A. R. & M. No. 1577. (19 pages and 21 diagrams.) January 5, 1931. Price 1s. 6d. net.

The object of the experiments was to provide a comparison of results on a larger scale model (one-fifth) with results of experiments made previously on a one-sixteenth scale model at Westland Aircraft Works, and to co-ordinate the results with those on the full scale, which are given in Part II of this Report.

Lift, drag, pitching moment and controller hinge moment were measured at 60 ft. per second originally over a range of incidence from − 2 deg. to + 33 deg. approximately and with controller or flap settings from + 15 deg. to − 45 deg. approximately. Incidence range was afterwards extended to 70 deg. for hinge moment measurements. The results agreed reasonably well with those on the smaller model. The slope of the curves, pitching moment against incidence, indicated that the machine should be longitudinally stable. Rudders of two different sizes were fitted to the wing tips and their effect on drag estimated over a range of incidence from − 2 deg. to + 10 deg. Presence of the rudders increased minimum drag by 5.7 per cent. for the small and by 6.7 per cent. for the large rudders. Various modifications to the model were also made and their effect on minimum drag was found to be small, the greatest reduction in drag, about 7½ per cent. being that due to fairing the undercarriage. Variation of the wind speed showed little scale effect, but the results indicated a slight reduction in minimum drag and a slight increase in maximum lift with increase in wind speed.

Lift and drag controller angles to trim have also been measured; minimum drag was carefully measured to compare with the exceptionally low value obtained in the model tests.

The Pterodactyl design as developed in the Mark IV is, from a performance point of view, good, the very low minimum drag achieved by its clean body and undercarriage lines giving a good top speed and climb. The stalling speed is high, due to its rather poor maximum lift coefficient. The latter is difficult to avoid in this design, as the controllers have to be held at a large negative incidence to stall it and therefore cannot contribute to the lift. Its general stability and control is fairly good and comparable to that of a normal aeroplane, although the anticipated lateral stability at the stall has not been realised. The bad take-off involving a run of 250 yards, is the worst feature of the Pterodactyl Mark IV.

AMERICAN MILITARY MONOPLANES

By ALFRED CELLIER

(*Continued from page 865*)

WITH the Observation Class a repetition occurs in two of the models that are identical to their prototypes of light bombardment aeroplanes, except for their interior installations, which do not include bomb racks. The first of these is the Fokker 0-27, whose prototype is the B-8. This is an Army Observation machine with the same power plant and dimensions as the bomber. The span is 64ft., length 47ft. 6in., and the height 11ft. 6in. The other Army Observation type is the Douglas 0-35, prototype of the Douglas B-7, and identical in all outward respects. The purpose of these aeroplanes is long-range reconnaissance and night-observation missions, and a number of them are allotted to squadrons of the 9th Observation Group for service tests. With minor changes they are readily convertible to light bombers.

The Corps Observation types, not to be confused with the Army Observation machines, are the single-engined aeroplanes, such as the Douglas 0-31 class. This is a typical two-seater monoplane with the Gull-wing, giving the pilot and observer excellent vision in all directions. The landing gear is not of the retractable type, but "pants" on the wheels add to the speed, which is reputed to be in the neighbourhood of 195 miles an hour. The 99th Observation Squadron is composed of machines of this type. Another such model is the Douglas 0-43 (see *Flight* of February 15, 1934), almost identical in appearance and dimensions, except that it employs a parasol-type wing in place of the gull-wing of the "0-31"; its speed is about 190 m.p.h.

Also of the Corps Observation class, but not of monoplane design, is the new Curtiss "Raven," or 0-40, with the Wright "Cyclone" F engine of 700 h.p. This is a two-seater sesquiplane with transparent hooded cockpits and a retractable landing gear, which give it a high speed of 200 miles an hour. The dimensions of this machine, of which a few have been delivered for service tests, are: Span (top), 43ft. 11in., and a length of 28ft. 3in. (A description was published in *Flight* of January 4, 1934.—ED.) A later model of the Raven, the 0-40B, is a high-wing parasol monoplane.

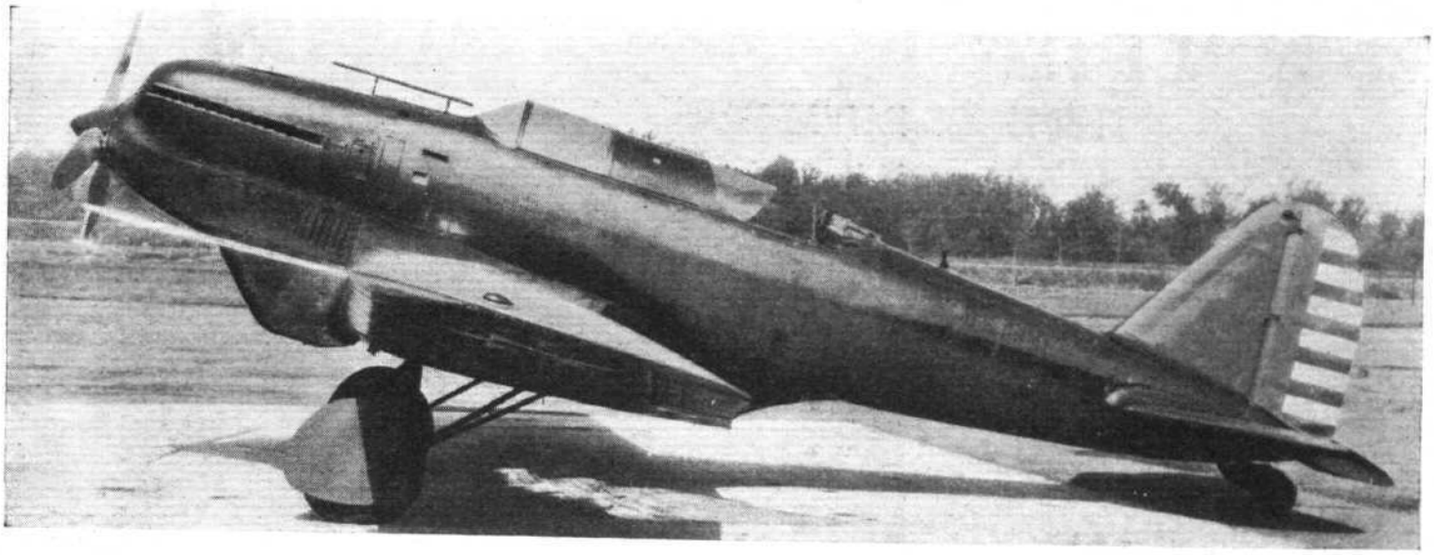
FOR ARMY OBSERVATION: The Fokker 0-27 is designed for long-range reconnaissance. It is fitted with two Curtiss "Conqueror" engines of 650 h.p. each.

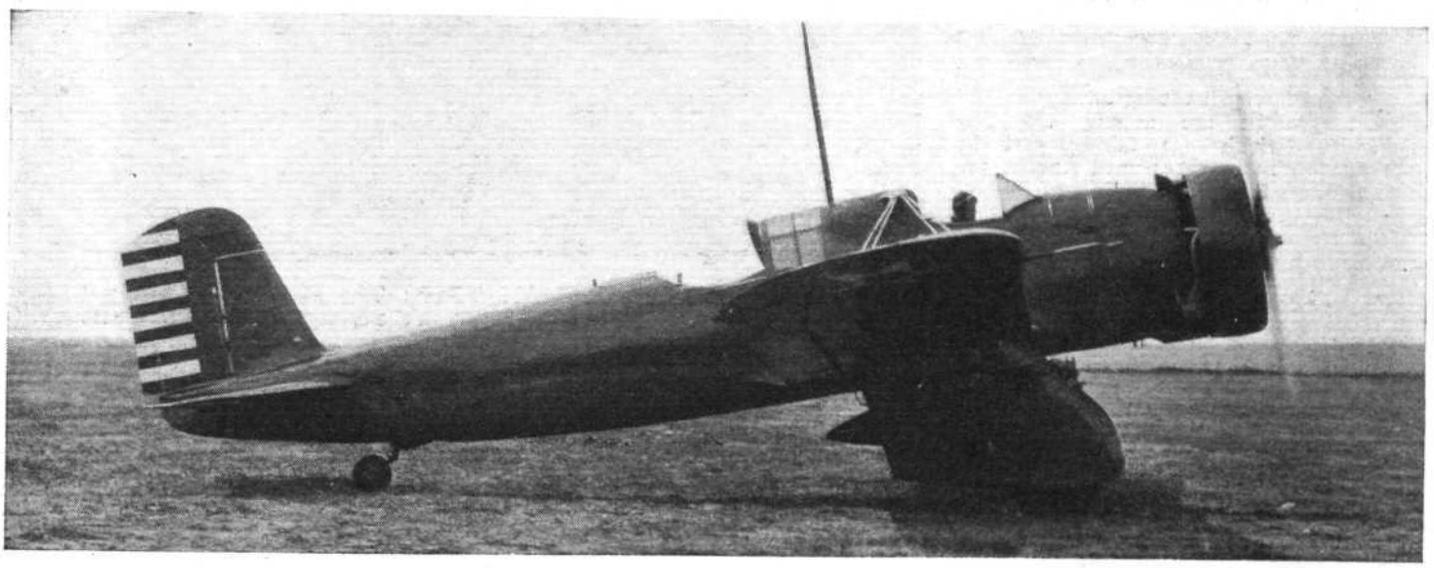
THE DOUGLAS VERSION: Like the Fokker 0-27, the Douglas 0-35 is an Army Observation type. It has the same type of engines, but is strutbraced and has the "gull's wing" formation.

CORPS OBSERVATION TYPES

UNLIKE THE ARMY OBSERVATION TYPES THESE ARE SINGLE ENGINED: The upper photograph shows the Douglas O-31, and the centre picture the Douglas O-43. Both have the Curtiss "Conqueror" engine. The lower illustration shows a machine in the same class, the Curtiss O-40B, but having a 700 h.p. Wright "Cyclone" radial air-cooled engine.

TWO ATTACK TYPES





FOR GROUND STRAFING: The Detroit (or Lockheed) A-9 seen in the upper photograph has a Curtiss "Conqueror" engine, while the Curtiss A-12 in the lower picture has the Wright "Cyclone" radial air-cooled.

The latest development of the Attack type is the all-metal Curtiss A-12, equipped with slots and flaps, ordered in quantities to outfit the 8th, 13th, and 90th Attack Squadrons. These low-wing monoplanes are powered with the Wright "Cyclone" F of 700 h.p., and can carry a 300lb. bomb beneath their fuselages. The top speed is about 220 miles an hour. They are practically identical, except for the power plant, to the Curtiss "Shrike" A-8 type, which has a span of 44ft. and a length of 32ft. Other monoplane Attack types undergoing trial are the Northrop A-13, all-metal two-seater, developing close to 230 miles an hour, and the Detroit A-9, the prototype of the P-24.

While on the subject of American military monoplanes, it would not be amiss to mention those Cargo types coming under this classification. These vary in design from the large tri-motored Ford machines to the smaller single-engined types, the speediest of which are the Northrop C-19, low-wing, six-place, all-metal cabin type, with a top speed of 220 miles an hour, and fitted with the Pratt and Whitney "Wasp" 450 h.p. engine, and the Lockheed C-17, high-wing, all-metal "Vega" type, also with the "Wasp" engine.

American Terms Explained

Students of military aviation who have not previously come into close contact with American Service matters may find themselves confused by the names of various classes of military machines in use in the United States. We feel, therefore, that a brief explanation may be useful. A "pursuit" machine is what we should know in this country as a "fighter." It may be either a single-seater or a two-seater. The origin of the name should be obvious, but the term is misleading, in that it may be taken to mean "interceptor." Of course, one of the main duties of the type is the interception and destruction of hostile aircraft, but it may be used also for ground attack and similar duties. It is, in fact, very similar to our day-and-night fighter class. In the American Navy the term "fighter" is used as in this country.

"Attack" machines are primarily intended for the destruction of enemy *personnel* and *materiel*. The main requirements of the type are high speed, large offensive armament, good performance at low altitudes, and moderate range. There is no equivalent type in the R.A.F.

Comparable with the so-called "Corps Observation" types are our Army co-operation machines. As well as performing observation and reconnaissance work, the "observation" machine may be used for light day-bombing. In long-range missions twin-engined and more heavily armed "Army Observation" types are used. Special fast day-bombers do not exist in the United States Army Air Corps, light bombing being performed by the attack and observation machines. The heavy "bombardment" types are really similar to our long-range night-bombers. In this class a machine carrying 2,000 lb. of bombs or less is often called a "light" bomber, the heavy types carrying as much as 4,000 lb. of bombs.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

The Police Autogiro

Flights made over London by the Scotland Yard Autogiro have been so successful that the C.I.D. is considering arranging a demonstration of the machine's use in catching criminals in motor cars.

Start of World Flight

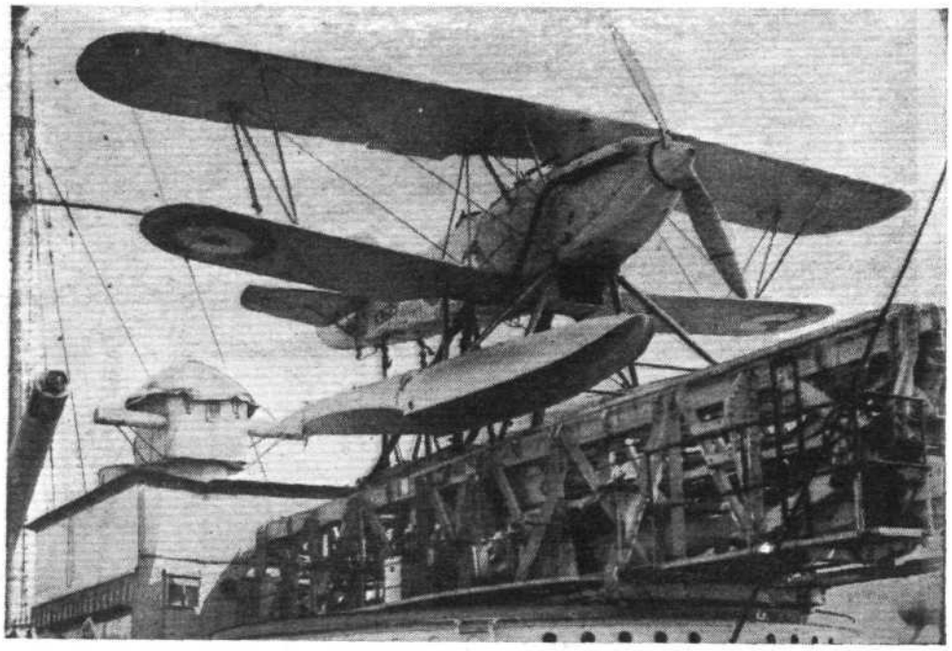
Doctor John Light, an American, left Cartwright, Labrador, on August 27 in a Bellanca seaplane on the first stage of a world flight. Doctor Light intends to fly to Marseilles *via* Iceland and Kirkwall (Orkney). He has with him a companion, and his machine is fitted with wireless.

French Air Manœuvres

Several heavy bombing aircraft of the latest pattern are among the 100 machines which are taking part in French air manœuvres until August 31. M. Georges Singnerin, the noted French test pilot, and a mechanic were killed while trying out a high performance two-seater in preparation for the manœuvres.

Formidable Polish Fighter

An improved version of the P.Z.L. P.XXIV single-seater fighter (Gnome-Rhone "Mistral Major") described in *Flight* for May 3, 1934, has a top speed of 251 m.p.h. at 14,760 ft., and climbs to 21,325 ft. in 8 min. 56 sec. Two Oerlikon "cannon," each provided with 40 rounds of ammunition, may be installed in the wings.



"OSPREY" ON AUSTRALIAN TRIP: The Hawker "Osprey" seaplane (Rolls-Royce "Kestrel" II.M.S.) on the catapult of H.M.S. "Sussex."

Mystery Aeroplane in Channel

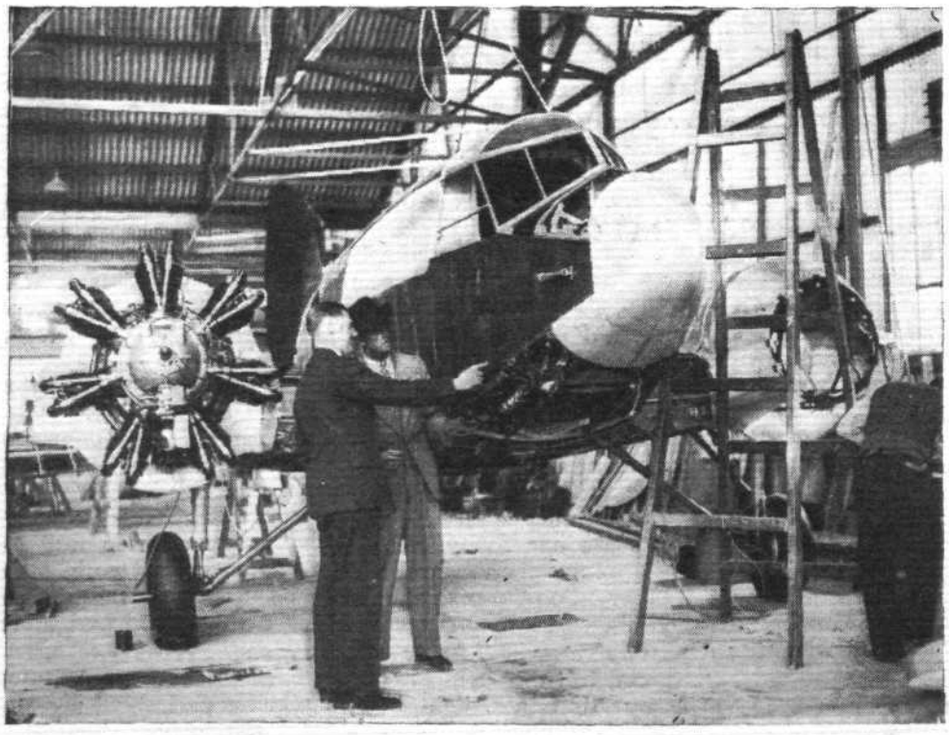
The identity of the blue-and-yellow aeroplane which was thought to have been seen to fall into the Channel near Criel-Sur-Mer on August 22 has not yet been established. The Dieppe lifeboat could find no trace of the machine.

Air Raids in Italian Manœuvres

Florence, Siena, Arezzo and Pistoia were the objects of air raids during the Italian Army manœuvres. Illumination in these cities was reduced to a minimum, the electric current being cut off at the danger signal. Bright moonlight, however, made many buildings visible to the attackers.

Russia's All-metal Airship

Russia is now constructing a small all-metal airship to the designs of Konstantine Tsiolovsky. This airship has a capacity of 1 000 m^3 (35,314 cu. ft.), and has no internal framework, sheets of non-corrosive steel, one millimetre thick, bolted together to form the envelope, giving, it is claimed, sufficient rigidity. There are, however, two internal girders, running longitudinally along the bottom of the envelope, which serve as supports for the gondola.

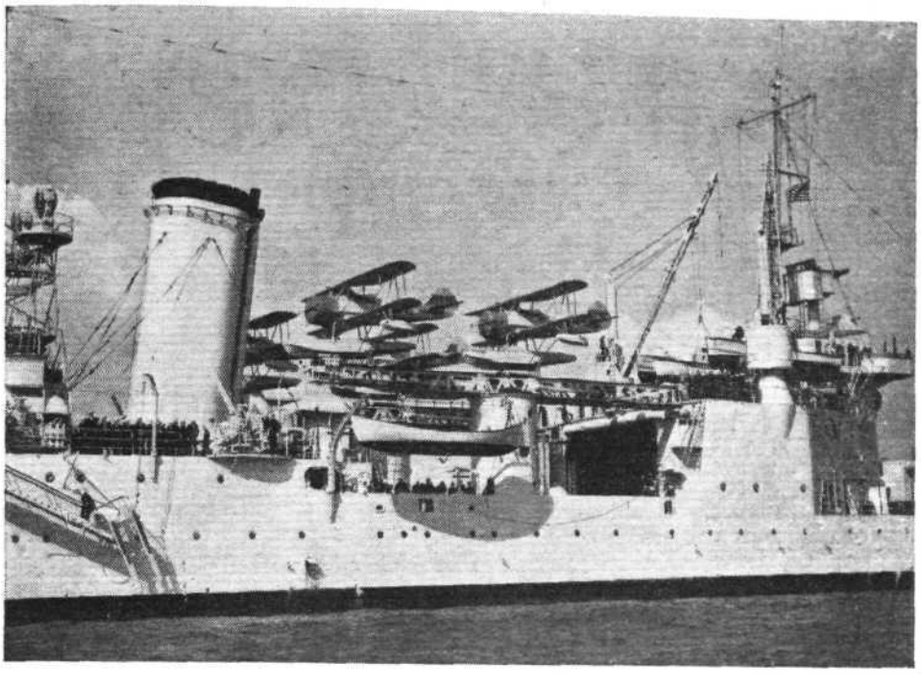


FOR THE ENGLAND-AUSTRALIA RACE: Capt. T. N. Stack and Mr. S. L. Turner examining the "Airspeed A.S.8." (2 Siddeley supercharged "Cheetahs") at the makers' works at Portsmouth. The machine is somewhat similar to the "Envoy."

Twenty-five Years Ago

From "Flight" of August 28, 1909

"A Cross-London Prize.—No less a prize than a one hundred guinea cup awaits the intrepid British aviator who first crosses the Metropolis from north to south or *vice versa*. The only conditions the donors, Messrs. P. B. Burgoyne and Co., attach to their offer are: (1) that every part of the machine be of British manufacture; (2) that the aviator be a subject of the King; and (3) that the Thames be crossed between Tower Bridge and Westminster."



IN ENGLAND NOW: The 10,000-ton U.S. cruiser *Minneapolis* arrived at Gravesend last Friday for a ten days' visit. Here are her four Vought "Corsair" seaplanes. Compare this photograph with that of the catapult on H.M.S. *Sussex*, which is going to the Melbourne celebrations.

Grierson's Northern Flight

Mr. John Grierson, who is making a flight from Britain to Canada, left Reykjavik, Iceland, for Greenland, on August 22. He later sent an S.O.S. which was picked up both in Copenhagen and by the trawler *Dervish*. This was followed by a request for a search to be made for him. Rescue parties set out, but Mr. Grierson managed to reach Angmagssalik unaided. On August 26 Mr. Grierson reported that he had flown across Greenland to Godthaab, and that he expected to leave for Lake Harbour or Povungnetuk. He left Godthaab on the afternoon of August 27, it is thought to fly to Resolution Island in the Hudson Strait, a distance of about 600 miles.

More Stratosphere Ascents

M. Max Cosyns is unable, at present, to give detailed information about his observations made in the stratosphere during his recent ascent. The calculations involved will take about a month. M. Cosyns states that he believes Prof. Piccard plans to ascend about twenty miles. A report from America states that on September 3 Prof. and Mme. Jean Piccard will leave Ford Airport, near Detroit, with the intention of rising about seven miles, for experimental purposes.

Roosevelt's Adviser Here

Mr. Clark Howell, who investigates aviation problems for President Roosevelt, arrived in this country by air on August 22 to study some aspects of flying. While Mr. Howell is in Europe four other members of the Federal Aviation Commission are making a 12,000-miles tour from the Atlantic to the Pacific, studying other phases of the aviation industry. They plan to meet in Washington on September 15.

Mr. Percival's Fast Flight

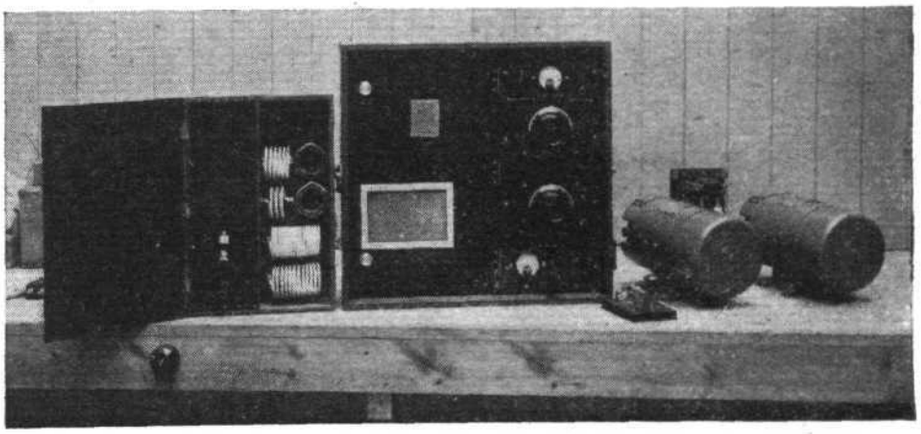
Mr. E. W. Percival, flying in a "Gull" to visit the International Aircraft Exhibition at Copenhagen, made the trip from Gravesend to Copenhagen, a distance of 640 miles, in four flying hours—an average speed of 160 m.p.h Mr. Percival landed at Amsterdam *en route*. While in Denmark the "Gull" made a flight of 343 miles at an average speed of 159 m.p.h.

A 267 m.p.h. Fighter

At the Dewoitine factory several single-seater fighters, developments of the D.500 type which was described in *Flight* for March 15, 1934, are appearing. These machines are variously equipped with Hispano-Suiza Xbrs, Ycrs "canon," Lorraine "Petrel" Farman and Gnome Rhone K.14 ("Mistral Major") engines. With the Hispano-Suiza Ycrs engine of 860 h.p., the D.500 attains 252 m.p.h. A modified version of the D.500 is reported to have a top speed of 267 m.p.h.

Wireless in the Antarctic

An expedition to the Antarctic under the leadership of Mr. J. R. Rymill is leaving London in September to explore the region round Graham Land. The members are sailing in a small vessel, and will establish a base station on Hearst Land or Graham Land from which they will pursue their investigations. A D.H. "Fox Moth" fitted with floats will be used to explore the ice formations in Marguerite Bay preparatory to the advance of the ship. The ship and base station will be in wireless telegraph communication with each other, and with the Falkland Islands and Portishead by means of short-wave transmitting equipment supplied by the Plessey Company. Mr. F. J. Meiklejohn will be in command of the communication system.



FOR THE BRITISH ANTARCTIC EXPEDITION: The Plessey short-wave transmitter and generators.

Diary of Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in this list.

Aug. 28-Sept. 16. International Touring Competition, Poland.

Aug. 31. Opening of Newtownards Aerodrome, Belfast.

Sept. 1-2. Cinque Ports Flying Club International Rally, Lympne.

Sept. 1-9. National Soaring Competition, Sutton Bank.

Sept. 8. Midland Aero Club "At Home."

Sept. 15. Herts and Essex "Aerofête" at Broxbourne.

Sept. 16. Reading Aero Club "At Home."

Sept. 29. Leicestershire Aero Club "At Home."

Oct. 6. London to Cardiff Air Race and Cardiff Ae.C. Garden Party.

Oct. 7. Aviation Golf Meeting, Royal Porthcawl Golf Club Porthcawl.

Oct. 20. England-Australia Race for MacRobertson Prize.

THE ROYAL AIR FORCE

Service Notes and News — *Air Ministry Announcements*

DIRECTOR OF POSTINGS, AIR MINISTRY

Air Vice-Marshal R. P. Mills, C.B., M.C., A.F.C., has been appointed temporarily as Director of Postings at the Air Ministry. He was a pre-War pilot who, as an officer of the Special Reserve of the Royal Fusiliers, joined the Royal Flying Corps in 1912. He went to France with No. 4 Squadron on the outbreak of war, and gained the Military Cross for gallant conduct in the air. Since the War he has held several staff appointments, and in 1933 commanded the Central Area.

FLEET AIR ARM INCREASE

The naval correspondent of the *Daily Telegraph* announces that it is the Admiralty's aim to provide every capital ship and modern cruiser with two catapult seaplanes. At present the cruisers *Exeter* and *Achilles* are the only ships which carry two seaplanes each.

OXFORD UNIVERSITY AIR SQUADRON

Wing Com. C. N. Lowe, M.C., D.F.C., is to succeed Wing Com. K. R. Park, M.C., D.F.C., as chief instructor to the Oxford University Air Squadron. Wing Com. Lowe was up at Pembroke College, Cambridge, before the War, and it is a new move to appoint a Cambridge man to command the Oxford Squadron, but there is in the R.A.F. a dearth of Oxford men holding higher ranks, though Group Capt. Garrod is a notable officer from Oxford. C. N. Lowe will, apart from other things, command the reverence of undergraduates as having been one of the best wing three-quarters who has ever played in the England Rugby XV. By readers of *Flight* he will chiefly be remembered as the C.O. of No. 43 (Fighter) Squadron at the time when they put up a marvellous exhibition of squadron flying at the Hendon Display with wing tips looped together—the first time that such a performance had been seen. In the War he was one of the most gallant of our many fine fighting pilots, and no Military Cross and Distinguished Flying Cross have ever been more worthily earned. He is also a very able organiser and leader, and the O.U.A.S. should thrive under his command.

R.A.F. AND THE LIFEBOATS

The Royal National Life-Boat Institution has received from the church collections of the Royal Air Force a gift of over £16 to the lifeboat service.

MEDICAL BRANCH CONSULTANT

The vacancy in the post of consultant in ophthalmology caused by the retirement of Group Captain E. C. Clements, C.B.E., M.R.C.S., L.R.C.P., will be filled by the appointment of Squadron Leader P. C. Livingston, F.R.C.S. (E.), L.R.C.P., D.P.H., D.O.M.S.

NIGHT FLYING AT FARNBOROUGH

Owing to the nature of the approaches to the aerodrome at the R.A.F. Station, Farnborough, in future night-landing facilities at Farnborough should only be called for in cases of emergency.

AIR DEFENCE AT THE CRYSTAL PALACE

Each Thursday evening an exhibition of air defence is given by the 51st (London) A.A. Brigade, R.A., T.A., and the 315th (Surrey) A.A. Searchlight Co., R.E., T.A., as a regular part of the fireworks display. An aeroplane appears, is caught in the searchlight, and is then shot down by the guns. It is hoped that this will aid recruiting for the air defence Territorial units.

CALSHOT YACHT CLUB

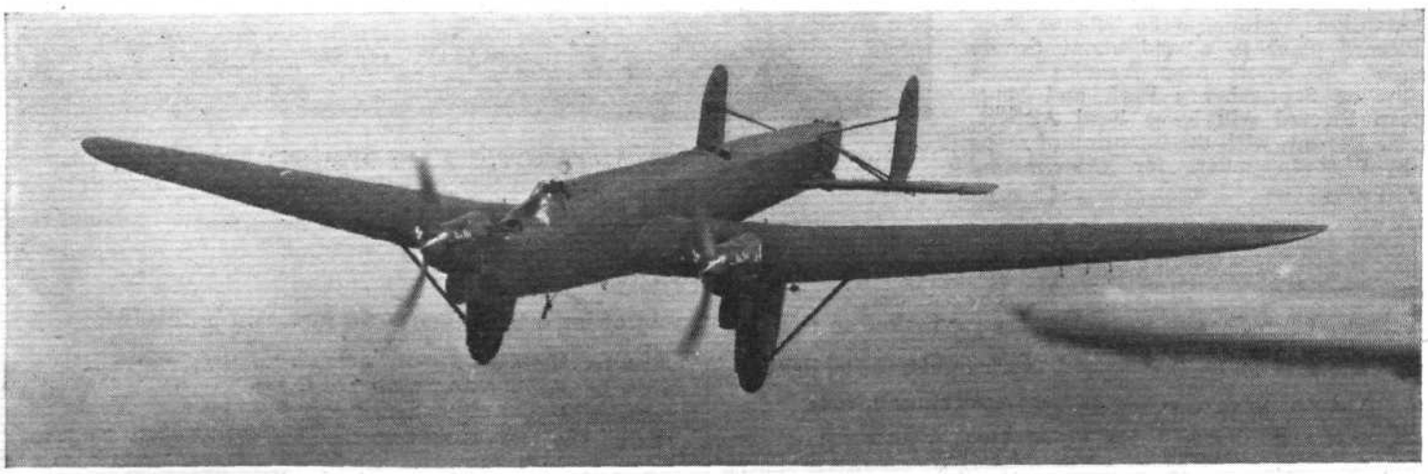
Approval has been given for the Calshot Yacht Club to be renamed "The Royal Air Force Yacht Club." All enquiries should be addressed as follows:—The Honorary Secretary, R.A.F. Yacht Club, R.A.F. Base, Calshot, Fawley, Southampton.

SWEDISH OFFICER STUDYING ARMY CO-OPERATION

Capt. A. G. Ljungdahl, of the Swedish Air Force, will be attached to the School of Army Co-operation, Old Sarum, Wilts., as from September 3, 1934, in order to undergo the Army Co-operation Course.

THE R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee of the above Fund was held at Iddesleigh House on Thursday, August 23. Mr. W. S. Field was in the chair, and Air Commodore B. C. H. Drew, C.M.G., C.B.E., and Wing Commander H. P. Lale, D.S.O., D.F.C., were present. The Committee considered a number of cases, and made grants to the amount of £241 os. 6d. The next meeting was fixed for Thursday, September 6, 1934, at 2.30 p.m.



FOR THE ROYAL AIR FORCE: The Fairey night bomber (2 Rolls-Royce "Kestrels") is now in production and will be the first monoplane, apart from amphibian flying boats, to be issued to the R.A.F. The machine as here seen was being piloted by Flt. Lt. C. Staniland, Fairey's chief test pilot. (*Flight* Photo.)

ELECTRICAL AND WIRELESS SCHOOL

The undermentioned officers, having successfully completed the specialist signals course at the Electrical and Wireless School, Cranwell, which terminated on June 29, 1934, are granted the symbol "S":—F/O.'s H. G. Adams, E. H. Bellairs, W. S. Hebden, G. Nelson, I. B. Newbigging, R. L. Phillips, M. Watson, F. F. Wicks, D.F.C.

The following have been selected to attend the specialist "S*" course:—F/O.'s E. H. Bellairs at l'Ecole Supérieure d'Electricité, and G. Nelson at Cambridge University.

SPECIALIST "E" COURSE

The undermentioned officers, having successfully completed the specialist "E" course at the Home Aircraft Depot, which terminated in June, 1934, are granted symbols as under:—

Symbol "E"*: Flt. Lt. E. L. Mole, F/O.'s H. P. Fraser, R. Harston, and G. Silyn Roberts.

Symbol "E": Flt. Lts. G. H. H. Procter, J. N. T. Stephenson, A. M. Stevens, J. H. T. Simpson, and P. G. Thomson. F/O.'s F. J. St. G. Braithwaite, H. B. Collins, G. Farnhill, R. F. Fletcher, C. E. Hartley, A. H. Houghton, L. E. Jarman, A. E. Louks, J. Mutch, G. J. C. Paul, M. E. M. Perkins, J. D. Rutherford, D. W. Smythe, N. A. Tait, R. Todd, G. N. Warrington, and W. R. Worstall.

The following have been selected to attend the Torpedo Course on H.M.S. "Vernon," commencing on September 3, 1934:—Flt. Lt. P. G. Thomson and F/O. F. J. St. G. Braithwaite.

AIRMAN PILOTS

Extension of period of flying practice.—Airmen who are accepted for training as pilots after the date of this order and are subsequently selected for re-engagement, will be required to keep in flying practice until they attain the age of 38 or are promoted to warrant rank, whichever occurs first. It will, however, be within the discretion of an air or other officer commanding, on the recommendation of a C.O., to decide at any time that an airman shall no longer be retained in flying practice if evidence that he has ceased to be an efficient pilot is forthcoming. While retained in practice, airmen will be liable for pilot service in emergency.

Airmen under training or already trained as pilots (including those who have been remustered to their basic trades), who desire to be retained in flying practice as provided above, may apply to their C.Os. towards the expiration of their present period of liability for such practice.

Extension of flying time.—The minimum amount of flying to be performed by all airman pilots who have been remustered to their basic trades and are in flying practice will in future be five hours a quarter.

NIGHT FLYING WITHOUT NAVIGATION LIGHTS

Night flying without navigation lights will be carried out by R.A.F. aircraft within the area: Gosport-Alton-Horsham-Shoreham and 12 miles out to sea between Gosport and Shoreham, on September 4, 5 and 6, 1934, during the hours of darkness. Aircraft will not exhibit navigation lights whilst flying above 4,000 feet, unless other aircraft are observed in the vicinity.

PAYMENTS TO PART-TIME TEACHERS

The rates of payment to airmen employed as part-time teachers are increased as from July 1, 1934, to the following amounts:—(i) For elementary courses, 38s.; (ii) for intermediate courses, 38s.; and (iii) for advanced courses, 57s. As from the same date the rate of payment for civilian part-time teachers is increased to 95 per cent. of that payable, immediately prior to October 1, 1931, by the local education authority of the area for work of a similar standard and character.

ROYAL AIR FORCE GAZETTE

London Gazette, August 21, 1934

General Duties Branch

Air Vice-Marshal R. P. Mills, C.B., M.C., A.F.C., is appointed temporarily as Director of Postings, Air Ministry, *vice* Air Commodore C. T. Maclean, C.B., D.S.O., M.C. (August 20); Pilot Officer P. de G. H. Seymour is promoted to the rank of Flying Officer (July 10); Lt.-Com. M. S. Slattery, R.N., is reattached to the R.A.F. as a Sqd. Ldr., with effect from August 9, and with seny. of July 1; Lt.-Com. C. John, R.N., Flt. Lt., R.A.F., ceases to be attached to the R.A.F. on return to Naval duty (August 8); Wing Com. E. L. Tomkinson, D.S.O., A.F.C., is restored to full pay from half-pay (July 23); Sqd. Ldr. C. W. Attwood is placed on the half-pay list, scale A, from August 8 to 13 inclusive; Sqd. Ldr. T. W. Elsdon is placed on the retired list (August 18); F/O. J. C. Atkins is transferred to the Reserve, class A (August 16).

Dental Branch

F/O. H. Keggin, L.D.S., is promoted to the rank of Flt. Lt. (August 22).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

The following are granted commissions as Pilot Officers on probation in class AA (i):—R. J. Falk (July 28); R. E. Stevenson (August 1).

J. A. Mortimer is granted a commission as Pilot Officer on probation in class AA (ii) (August 7).

The following Flt. Lts. are transferred from class A to class C:—P. W. S. Bulman, M.C., A.F.C. (August 19); H. D. Davis, A.F.C. (August 21).

F/O. W. S. Coates is transferred from class AA (i) to class C (August 17); F/O. R. W. Aitken is transferred from class C to class AA (ii) (August 10).

The following Flying Officers relinquish their commissions on completion of service:—L. B. McGoverne (January 6); J. W. Bradley (March 26); W. L. Robertson (July 7); A. P. Wayte (August 5).

SPECIAL RESERVE

General Duties Branch

J. F. Spanton is granted a commission as Pilot Officer on probation (July 23); Pilot Officer on probation J. Edwardes is confirmed in rank (July 13).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—J. H. Little is granted a commission as Pilot Officer (July 25).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—H. K. Thorold, D.S.C., D.F.C., A.F.C., to Headquarters, R.A.F., Iraq, Hinaidi, 1.8.34. For Air Staff (Operations) duties vice W/Cdr. R. D. Oxland, O.B.E. M. B. Frew, D.S.O., M.C., A.F.C., to No. 10 (B) Squadron, Boscombe Down, 15.8.34. To command vice W/Cdr. C. B. Dalison, A.F.C. R. S. Maxwell, M.C., D.F.C., A.F.C., to R.A.F. Base, Leuchars, 15.8.34. For Flying (Flying Instructor) duties vice W/Cdr. B. E. Baker, D.S.O., M.C., A.F.C. T. F. W. Thompson, D.F.C., to Headquarters, Central Area, Abingdon, 15.8.34. For Personnel Staff duties vice W/Cdr. E. D. Johnson, A.F.C. C. N. Lowe, M.C., D.F.C., to Oxford University Air Squadron, Abingdon, 20.8.34. On appointment as Chief Instructor vice W/Cdr. K. R. Park, M.C., D.F.C.

Squadron Leaders.—W. E. Swann, to R.A.F. Record Office, Ruislip, 10.8.34. For Administrative duties vice S/Ldr. A. H. Flower. D. L. Blackford, to D.O.I. Dept. of Chief of the Air Staff, Air Ministry, 17.8.34, vice S/Ldr. G. M. Lawson, M.C. G. M. Lawson, M.C., to No. 500 (Co. of Kent) (B) Squadron, Manston, 17.8.34. For Flying Duties vice W/Cdr. T. F. W. Thompson, D.F.C.

Flight Lieutenants.—R. A. P. Roberts, to No. 23 Group Headquarters, Grantham, 15.8.34. R. H. Page, to No. 2, Aircraft Storage Unit, Cardington, 15.8.34. R. A. A. Cole, to Headquarters, Far East Command, Singapore, 11.8.34. R. G. Forbes, to No. 13 (Army Co-operation) Squadron, Netheravon, 19.8.34. R. C. Savery, D.F.C., to No. 7 (B) Squadron, Worthy Down, 21.8.34. C. H. Schofield, to No. 16 (Army Co-operation) Squadron, Old Sarum, 28.7.34.

Flying Officers.—F. C. Cole, to No. 26 (Army Co-operation) Squadron, Catterick, 30.7.34. J. N. McAuley, to No. 16 (Army Co-operation) Squadron, Old Sarum, 30.7.34. D. W. Morrish, to School of Army Co-operation, Old Sarum, 30.7.34. E. R. Berry, to School of Naval Co-operation, Lee-on-Solent, 4.8.34. N. V. Bertram, to Air Armament School, Eastchurch, 9.8.34.

Pilot Officers.—The following Pilot Officers are posted to R.A.F. Depot, Uxbridge, on 14.8.34, on appointment to Short Service Commissions:—A. F. Bandidt, O. H. D. Blomfield, J. W. McGuire, and K. J. McKay.

Commissioned Signal Officers

Flying Officer.—J. R. Welsh, A.F.M., to Station Headquarters, Worthy Down, 9.8.34.

Stores Branch

Flying Officer.—A. R. Morton, to No. 25 (F) Squadron, Hawkinge, 9.8.34.

Accountant Branch

Flying Officer.—V. Matveieff, to Station Headquarters, Northolt, 20.8.34.

Medical Branch

Squadron Leader.—J. K. R. Landells, to R.A.F. Hospital, Cranwell, 12.8.34. For duty as Medical Officer.

Flight Lieutenant.—O. M. Fraser, to No. 1 Armament Training Camp, Catfoss, 20.8.34.

Flying Officer.—W. P. Stamm, to No. 2 Armament Training Camp, North Coates Fitties, 16.8.34.

COMMERCIAL AVIATION

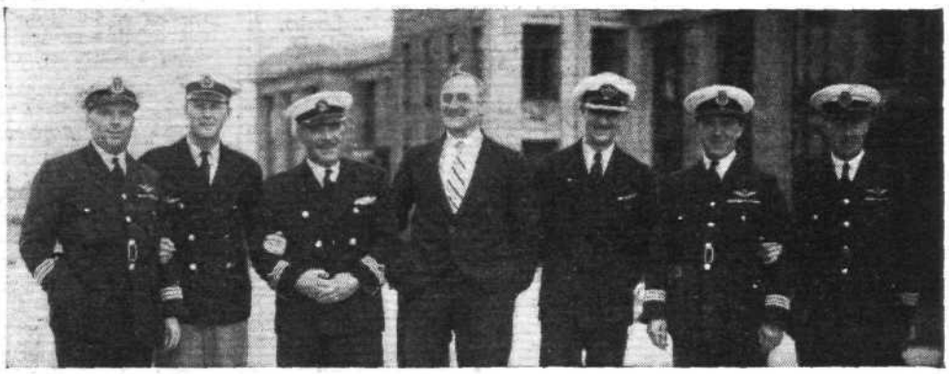
— AIRLINES — AIRPORTS —

CROYDON

Commercial Aviation's Fifteenth Anniversary : High Flying is Smooth Flying : Fastest to Paris : The West of England Service : The Economy of Larger Machines

SATURDAY, August 25, was the fifteenth anniversary of the commencement of commercial aviation in this country.

Looking round, one sees numerous people still at the airport who were there on the first day Croydon was opened as a civil aerodrome. A photograph, reproduced on this page, shows some of the veterans with "Bill" Lawford, who flew the first A.T. and T., Ltd., machine to Paris fifteen years ago, in the centre. Other antediluvian gentry in the group are Rogers and Dismore, of Imperial Airways, who flew early Handley Page aeroplanes to Paris; Bajac, chief pilot of Air France; Boudrie, Croydon manager of Air France; and Leverton, of K.L.M. The latter was with A.T. and T., Ltd., before joining the Dutch company.



Some of Croydon's "veterans" on the tarmac, with "Bill" Lawford in the centre of the group.

There are quite a number of other old stagers, on the mechanical side, whilst the Air Ministry staff can show a list of a dozen or so who have been in the business since the word "go."

Last week Railway Air Services, Ltd., opened their northern service. It was certainly not good flying weather up there, for the big K.L.M. machine on Monday, piloted by one of the company's veteran pilots, got no farther than Hull on the Amsterdam-Hull-Liverpool service. There was some nasty weather, too, on that day between London and the Continent, but as soon as the pilots got up to 6,000 ft. there was not a "bump" in the sky. As a rule high flying makes all the difference in such weather, though, of course, it is not always possible. I spoke to English, French and Dutch airline pilots, and all of them had flown high. One Dutchman, van Dyk, crossed the Channel to Croydon three times that day and had not a single passenger who was not delighted with the smooth travel. There was a certain amount of covert sneering at the air services by some of the more conservative railway people, but it is probable that these superior persons did not know that the L.M.S. express, "Mancunian," had broken in two the same afternoon, and that only the skill of the crew had averted disaster. That was mechanical breakdown, and not wind and weather.

I wonder how many air companies still have straps fitted to the passenger seats. There are times when such things can be distinctly useful, as, for instance, when flying through a gale. Also, there is such a thing as a puncture when taking off and the certainty of a rough, though doubtless perfectly safe, landing at the other end. I happen to know that several companies still have them fitted, but so concealed that they are not noticed. The blue riband of the London-Paris route appears to have left Croydon, for Hillman's Airways, Ltd., advertises the fastest air route between London and Paris—90 minutes. But is it? I see that an hour is allowed between King's Cross and Essex Airport, and this is all part of the journey. At the other end, between Le Bourget and Paris, only three-quarters of an hour is allowed. Air France allows three-quarters of an hour at each end, and also advertises 90 minutes for the flight. Which is the fastest service?

Provincial Air Lines, Ltd., have been running very successfully to the West of England lately. I am told that Newquay is a very popular flight from Croydon, and one which shows an increasing passenger list. One of their passengers to the West recently was a sportsman of 87 going on a fishing holiday. It was his first flight and he thoroughly enjoyed it, though it took place on the day of the gale. The well-known "door to door" service of Provincial Airways may have been "door to riverside" in this case.

Last Saturday evening the K.L.M. F.XX, with the retractile undercarriage and the extra turn of speed, brought Princess Ingrid of Sweden from Malmo. The Princess never travels other than by air if there is a service. This is literally "a flying visit," for she was to return by the 7.0 a.m. K.L.M. service on Wednesday. One day last week I was introduced to a fair air traveller making her sixth or seventh trip to Holland. She was two years of age!

The Isle of Wight services continue to be popular. On Sunday evening I saw three machines pass over in formation. This means three pilots to pay and nine engines to maintain instead of one pilot and three engines in a larger machine to carry the same load.

Home Office officials who examine passports here have, for the most part, been at Channel ports in their time; they say it is surprising to see the increasing number of regular passengers who used to pass through their hands as boat travellers —once upon a time.

A. VIATOR.

A "Shell Aviation News" Special

Even the most cursory glance through this month's Special International Air Traffic Association number of "Shell Aviation News" will indicate the tremendous work for civil aviation that has been done by the Shell organisation. In the leading article fuel provision is described from the days when dumps were prepared, months in advance, with the necessary number of two-gallon tins, to the present, when underground tanks with electrically driven fuel pumps, special tanker trucks with a delivery speed of no less than 4,200 gallons an hour, and seaplane tank launches are used all over the world.

But the provision of a complicated supply organisation is not the only work of the Shell Company, who broadcast information on aerodromes, routes, and meteorological conditions which has been collected over a number of years in various parts of the world. As a simple instance, plans of every important aerodrome in the world are obtainable.

In this special issue there is, additionally to the more normal articles and news features, a supplement with articles dealing with aspects of international air traffic and with the various air line operating companies throughout the world. The issue, in fact, will provide a most useful reference work for all who are interested in commercial aviation.

HESTON

The Beechcraft in England : Interesting Modifications by Airwork : A Mongrel Charter : New Offices at Heston

THE first American Beechcraft to visit England arrived at Heston on Tuesday, flown by Mr. White, Aviation Sales Manager of the Vacuum Oil Co., with Mr. Faust, the Aviation Director. The machine is making a tour of Europe, and has already visited Scandinavia, Germany, and Holland. This four-seater machine is one of the first with back-staggered wings to be seen in England since the War. Another of these interesting machines may be seen in England soon, as Mrs. Mollison is now an agent for Beechcraft products.

Another machine which has recently been modified by Airwork is that of Mr. W. D. Macpherson, a Leicestershire pilot-owner, who left last week-end for Poland to take part in the International Touring Competition, starting from Warsaw on the 28th. Few owners of English machines can take part in this round-Europe flight, as regulations of entry demand dimensions and performances more favourable to Polish aircraft. Mr. Macpherson, however, has had his "Puss Moth" considerably modified. Designs for complete wing-tip to wing-tip slots, by Herr Haffner, the Austrian inventor, and for controllable flaps by the Martin Aircraft Co. have been incorporated, among other modifications. A special "Gipsy Major" engine, with hand starter, has been installed, and Dowty legs for the slow landing test.

B.A.N.Co. say that late one evening recently they were able to provide Mr. Bickle, a director of the Pennsylvania Railway Co., with a Jersey Airways "Dragon" and a Birkett pilot, to transport himself, his wife, and a considerable amount of luggage to Southampton, in time to catch the s.s. *Leviathan*. All was done with half an hour's notice.

Wrightson Air Hire report that they have already twenty-three bookings for September, and have chartered a Gipsy I machine to a journalist for a fortnight's Continental tour.

R. K. Dundas, Ltd., the Airspeed agents, have leased an office at Heston, and a very smartly turned-out "Courier" has been seen on the tarmac and been temporarily borrowed by London, Scottish and Provincial Airways, Ltd. Another new name to be put up at Heston is that of the Heston Aircraft Company, which has taken charge of Comper Aircraft. A new design and development policy is to be pursued.

The longer established firms report a busy week. Henlys, Ltd., have delivered a new Cierva Autogiro to Bata's of Zlin. Brian Lewis and Co. have sold two new "Leopard Moths," one to Colonel A. Hamilton-Gault, M.P., and the second to Mr. Prendergast, of East Africa, who for some time past has been flying a "Puss Moth" purchased from Misr Airwork in Egypt. Another "Leopard" has been sold to the Marquess of Douglas and Clydesdale, and a Gipsy I "Moth" to Mr. Pennyfather, of the Cork Aero Club.

Belfast's New Airport

The Ards Airport, near Belfast, is already busy. Mr. Davidson, a well-known American motor cycle manufacturer, came over for the T.T. races, and took the ideal way back to Gleneagles in the Airwork School "Cadet," while Hillman's Airways are using the airport daily. One or two of their "Dragons" arrive and depart every afternoon.

The Governor of Northern Ireland will perform the opening ceremony at 2.30 p.m. next Saturday. After the opening speech the Governor will hoist the civil air ensign, and the first school aeroplane, an Avro "Cadet," will be officially christened, appropriately enough, with its glistening white fuselage and silver wings, *Finnian the White*, after the famous Ulster saint. There will be demonstrations of the Hawker "Fury," the Airspeed "Courier," the Avro "Commodore," the Klemm "Swallow," and the Autogiro. Mr. S. A. Thorn will do aerobatics on a "Tutor" fitted for inverted flying, and three Hillman "Dragons" will joyride when the display is over.

The hangar at Newtownards is finished, and the D.F. station, clubhouse and petrol pumps should be ready for the opening.

The Automobile Association and the Royal Aero Club announce that the Duchess of Bedford has made arrangements for the safety and convenience of pilots flying to Newtownards by the Stranraer route. From August 30 to September 1, inclusive, Creetown landing ground will be open to pilots landing either on account of weather or to refuel, and special permission to use the ground need not be obtained during this period. A small stock of petrol will be available.

The Douglas in Europe

Since it was first learnt that Fokker had purchased the Douglas and Lockheed licences, everybody has been anxiously awaiting a glimpse of the D.C.2. The first will reach Rotterdam on September 12 on the s.s. *Statendam*.

Egyptian Air Lines

The figures for the regular and week-end services operated by Misr Airwork are slowly mounting. During the week ended August 12, 183 passengers were carried, 154 of these travelling on the Alexandria service. A summer season line to Ras el Bar operates on Fridays and Saturdays from Cairo.

Farther East

The series of emergency landing-grounds which is being prepared in Siam is now nearing completion. Pitsanuloke aerodrome is ready and has been licensed for use by all aircraft. There are two runways, each 800 metres by 100 metres, with hard-core strips down the centre lines. Raheng emergency landing-ground is also ready for use, but it is not yet definite that it will be all-weather. The official opening of Penang aerodrome for light aircraft took place on Sunday, August 5, when a gymkhana and flying display were held. Two R.A.F. flying-boats and a squadron of bombers flew up from Singapore, and seven private machines from Kuala Lumpur also attended. The Imperial Airways "Aurora," commanded by Captain V. G. Wilson, circled the aerodrome.

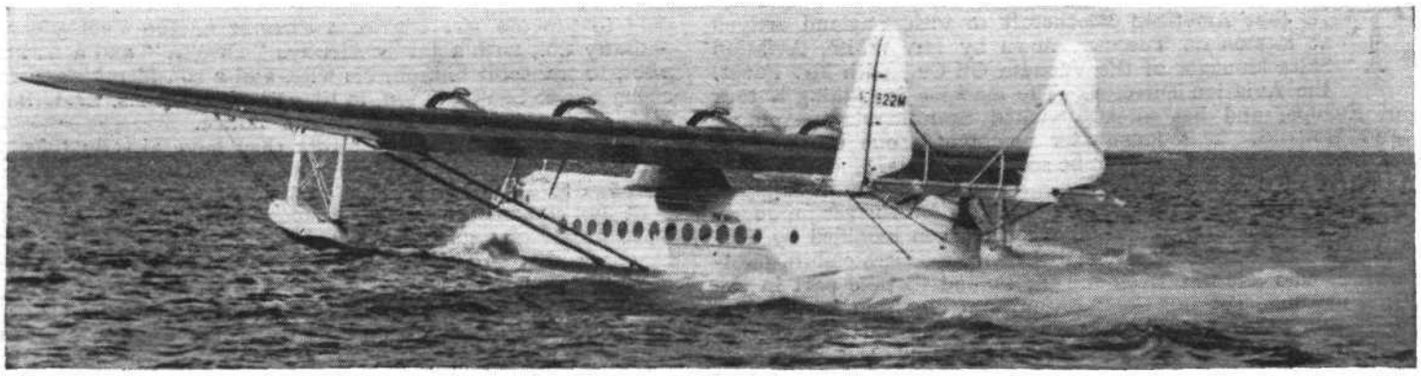
The eastbound Imperial machine now almost invariably makes a night landing at Singapore.

THE STINSON "MODEL A": This feeder line machine, with three 240 h.p. Lycoming engines, was described in *Flight* of March 29 this year. Eight passengers are carried at a cruising speed of 150 m.p.h. at 5,000 ft., and the landing gear is of course retractile.

Commercial Aviation

PERFORMANCE TESTS OF SIKORSKY S-42

Maximum Speed of 188 *m.p.h. at* 36,000 *lb. Weight*



***BRAZILIAN CLIPPER* TAKES OFF: Pan-American Airways' first Sikorsky S-42 leaves Biscayne Bay for Buenos Ayres. It is reported that Short Bros. are building a large trans-oceanic boat for Imperial Airways.**

SOME startling figures were recorded in America during the performance tests of the Sikorsky S-42 flying boat, which is fitted with four geared and supercharged Pratt and Whitney "Hornet" engines of approximately 700 h.p. each. This machine, it may be remembered, has been built for Pan-American Airways.

Our American contemporary *Aviation* states that although the design load licensed by the Department of Commerce is 38,000 lb., there are indications that, for certain purposes, the machine may be flown at a gross weight of 40,000 lb. During tests at a weight of 36,000 lb. the average take-off time was from 17 to 26 seconds, depending on wind velocity and waves. At 38,000 lb. the averages run from 18 to 32 seconds. The machine climbed from sea level to 3,500 ft., when loaded to 36,000 lb., at a rate of 1,000 ft. per minute, this figure being reduced to 850 ft. per minute at 38,000 lb. gross weight. In 47 minutes, loaded to this latter figure, the machine climbed to 15,456 ft., and at 33,500 lb. took exactly one hour to climb to 20,406 ft. These latter performances have been homologated by the F.A.I. as world records.

At full throttle and sea level the machine made a speed of 182.5 m.p.h., flying at 36,000 lb. Cruising on 75 per cent. power at sea level the speed was 160 m.p.h. A maximum speed of 188 m.p.h. was recorded at full throttle at 5,000 ft. Using 73.5 per cent. power at 7,800 ft. a cruising speed of 171 m.p.h. was obtained.

The performances on various engine combinations are worthy of note. With any three engines operating, and delivering 670 h.p. each, an average of 154.1 m.p.h. was recorded over the speed course. When the output of the engines was reduced to 575 h.p. each, the corresponding figure was 142.2 m.p.h. At 10,000 ft. with a gross load of 33,300 lb. level flight at 144 m.p.h. was maintained on three engines. Actually a few tests were made using two engines. In this case at a gross weight of 27,500 lb. level flight was maintained at 112 m.p.h. at 4,300 ft.

With flaps down the landing speed was about 65 m.p.h. at an all-up weight of 36,000 lb. Hamilton Standard three-bladed two-position controllable pitch airscrews were used for all these tests, the low pitch setting being 20 degrees and the high pitch setting 26 degrees.

The empty weight of the aircraft is given as 19,764 lb., which leaves 18,236 lb. for useful load. A crew of five, consisting of two pilots, mechanic, radio operator and purser, is regularly carried. There is accommodation for 32 passengers, and roughly a ton and a quarter of baggage, mail and other cargo can be carried.

"Sleeper Services" in the U.S.

Eastern Air Lines Inc. serve twenty-nine cities between New York, the Gulf of Mexico, and Chicago, and, under its recently enlarged schedules, 60 per cent. of its flying is done at night. The machines, Curtiss-Wright "Condor" biplanes, are equipped with "sleeper" accommodation.

P.S. and I.O.W. Aviation Figures

Back to normal after the main holiday period, the Portsmouth, Southsea, and Isle of Wight Aviation, Ltd., are still carrying well over two thousand passengers a week between Portsmouth and the island. During the week ended August 16, 2,563 passengers were carried, and last week the figure was only two hundred lower than this. Between Heston and the Isle of Wight the traffic jumped from 156 to 181 passengers.

Specialised Charter

Starting operations rather less than a month ago, Commercial Air Hire, Ltd., a new company specialising in trade or "overflow" charter work, carried more than eight tons of freight and covered 13,000 miles during the first sixteen days of operation. Most of the work, incidentally, was obtained through Air Dispatch, Ltd., Mrs. Victor Bruce's company.

Commercial Air Line, Ltd., the directors of which are Mr. John Pugh and Mr. D. Godley, have two plain D.H. "Dragons" fitted with wireless and night-flying equipment, a D.H. "Fox Moth," and a D.H. "Puss Moth"; three further "Dragons" are on order. The pilots are Mr. John Pugh, of aerobatic fame, and Flt. Lt. A. P. K. Hattersley, who was previously with Midland and Scottish Air Ferries.

It appears that a number of regular companies require, on occasion, a temporary addition to their fleet, and Commercial Air Hire, Ltd., will provide machines and pilots for any work of this nature.

Indian Developments

Last month the Government of India completed the provision of a new landing ground at Gaya, which lies between Allahabad and Calcutta, and south of Patna. This aerodrome allows the Imperial Airways and Indian Trans-Continental machines to fly the last leg to Calcutta in two stages, and so, if necessary, carry more freight and less fuel.

Ground organisation in India is becoming more and more important. In December the route to Australia will be opened, and there are strong reports that British merchants in China are working in co-operation with Japan for the establishment of an air mail service between Singapore, China, and Japan. A British company has for some time been endeavouring to persuade the Chinese National Aviation Company to extend its service between Shanghai and Canton to Hong Kong. There are two alternative routes, one from Singapore to Saïgon, Hong Kong, Shanghai, Fukuoka and Osaka, and the other *via* Formosa.

In the meantime, Tata Sons, Ltd., have all the organisation ready on the Indian side for an extension of their mail service between Bombay and Colombo, and are merely waiting for the aerodrome which is being laid out at Ratmalana, some eight miles outside Colombo. Tatas, it will be remembered, have been running a most efficient mail service between Karachi, Bombay, and Madras since October, 1932, to connect with the Imperial Airways England-India time table.

At the annual meeting of the Madras Flying Club, Ltd., the chairman, in the course of his speech, remarked that, in order to encourage the development of new air lines, more aerodromes were required. For the development of air-lines in India, he said, it was essential that night flying should be adopted and organisation accelerated. The business done at present might not justify the expenditure necessary, but if accelerated services were given business would surely develop.

A BRITISH "RUNDFLUG" ENTRY

A "Puss Moth" with Slots and Flaps

SPECIALLY prepared with slots and flaps, the "Puss Moth" belonging to Mr. W. D. Macpherson has been entered for the 1934 "Rundflug" or International Touring Competition which is being held from Warsaw between August 28 and September 16.

This "Puss Moth" is calculated to have a minimum flying speed of some 35 m.p.h. It has not been altered structurally except for certain modifications necessitated by incorporating slots and flaps. The work was done at Heston, in the Airwork shops, under the general supervision of Mr. Parkes, and to the designs of a "committee" composed of Herr Hœffner (who is designing a helicopter at Heston), Dr. Lachmann (of Handley Page, Ltd.), and Mr. Martin (of the Baker-Martin Aircraft Company, who are producing a machine which is rumoured to be something rather special), with, of course, general help from the staff of the De Havilland Aircraft Co., Ltd.

The slotted and flapped "Puss Moth." (*Flight* Photo.)

The slots extend the whole length of the wing and are controllable. They are the built-up type and inset so that they form the leading edge of the wing. The ailerons have been modified so as to droop an equal number of degrees without altering the amount of control, and thus assist as flaps. This drooping can only be carried out on the ground, and will therefore only be utilised for the tests in which they are needed. The large flap which forms the inner end of the trailing edge of each wing of a "Puss Moth" has been altered to hinge downwards and act as a controllable flap. The use of both slots and flaps has naturally altered the distribution of the torsional stresses in the wing, and has necessitated a certain amount of additional internal bracing.

Other alterations to the machine are:—bulging the sides of the fuselage so that the effective width of the cabin is greater than standard; the addition of extra windows in the rear portion of the cabin; fitting a drift sight in the floor of the cabin; the use of Dowty compression legs in the undercarriage so that full advantage may be taken of the slots and flaps when landing; alterations to allow the cabin doors to be released quickly (as parachutes are carried); fitting a special control to the cabin ventilating system; and fairing of the axle and radius rods of the undercarriage into one clean unit.

The engine fitted is one of the high compression "Gipsy Major" type with an adjustable pitch Fairey metal airscrew, which should give the machine a higher speed than the standard "Puss Moth," while the slots and flaps will decrease its landing speed. These, coupled with the other modifications, will undoubtedly make Mr. Macpherson's entry a formidable opponent for the foreign machines, many of which are built specially for the competition and which have to be strengthened up before they can be put into production, as in their competition state they would not stand the wear and tear of ordinary usage. That is one of the drawbacks of building machines down to a weight for a competition like this. With its modifications this "Puss Moth" is only just within the specified weight, and will, therefore, be handicapped in comparison with other entries.

FLYING AMERICA'S LATEST

A 170 m.p.h. Four Place Biplane

WALTER BEECH, who used to be the power behind the Travelair concern, has produced a most interesting machine in his "Beechcraft" (*Flight*, May 17, 1934). Though carrying four people in a comfortable cabin, it has a better performance for only 225 h.p. (Jacobs engine) than the machines of other American designers.

The model we flew recently has been brought to Europe by Mr. W. Faust and Mr. H. J. White, of the Socony-Vacuum Oil Co., Inc., and it impressed us most favourably. It has not the lateral or longitudinal stability of most American aeroplanes, in fact it is almost neutral on these axes, but its manœuvrability is excellent. Directionally it is perfectly stable although the rudder is heavier to operate than the ailerons or elevators.

With a cruising speed of 150 m.p.h. the outlook is very important, but we did not find the extreme slope of the one-piece curved safety-glass windscreen detrimental at all. Even when flying at night there was no reflection except when the dashboard was too brightly lighted. Once the machine is flying, the pilot has a very wide field of view, but the nose is too large for comfort when taxying.

Showing interest in the Beechcraft at Reading. (*Flight* Photo.)

The undercarriage folds up quickly, inwards into the middle of the fuselage beneath the cabin floor, being operated by compressed air from the Heywood engine starter system. When lowered it steepens the glide and slows up the machine, but flaps, controlled by a hand lever, and hinged to the rear bottom spar, are also fitted so that landings can be made in confined areas.

Being a biplane and having a pronounced back-stagger, the "Beechcraft" looks unusual for an American machine, but this arrangement certainly results in an excellent view for the pilot and his passengers and an uncommonly high performance.

C. N. C.

Organising the MacRobertson Race

(*continued from p.* 894)

Progress of Race Machines

Most of the British entries will be ready during the next three or four weeks. It is understood that the Miles "Falcon" and "Hawk Major" will be standard models, with the exception that the "Falcon" will be fitted with an extra 35-gallon tank. The tankage of the "Major" has not yet been definitely decided, but it will not be less than 50 gallons. In all probability it will be increased considerably.

Flt. Lt. G. Shaw's British Klemm "Eagle" will be a standard model with an extra 30-gallon tank installed in the cabin, making 70 gallons capacity in all.

Short Bros. tell us that although they understand that a Short "Scion" has been entered by Mr. Wallace they have received no order or instructions from this gentleman. We believe that there are only two "Scions" in existence. Both of these are operating in this country at present.

Last week we were privileged to inspect the three "Comets" (two "Gipsy Six" engines) now being built at the de Havilland works at Stag Lane. At the moment it is not permissible to give details of these machines, and all we can do is to state that the de Havilland designers have turned out some very pretty aeroplanes but never a prettier model than the "Comet." What particularly impressed was the fact that the machine is by no means a "racing freak." In the MacRobertson race, with the long stages to be covered, the wing loading will be high, certainly, but there is no earthly reason why after the race, the machines should not be modified slightly, the quantity of fuel carried be reduced, the wing loading lightened, and the machine be used as a very efficient, fast and economical mail carrier. We commend it to the attention of air mail operators at home and elsewhere. As a mail-plane the "Comet would probably cruise at somewhere very near 200 m.p.h., and with two engines of such relatively low power the type should be very economical to operate

Sqd. Ldr. J. D. Hewitt and F/O. C. E. Kay, who are to fly the D.H. "Dragon Six" nominated by the New Zealand Centenary Air Race Committee in the MacRobertson Race, arrived in London this week. After the race the machine will be flown to New Zealand. F/O. Kay, accompanied by F/O. H. L. Piper, flew to Australia in 1930. Sqd. Ldr. J. D. Hewitt served in France with the R.A.F. during the war.

Some dissatisfaction is being expressed by pilots in the Irish Free State that the nationality of the Irish Hospitals Trust entry for the MacRobertson race is given in the official list as "British." It has been pointed out that the principal nominator, Mr. Joseph McGrath, and the chief pilot, Col. J. C. Fitzmaurice, are Irishmen. Both the machine, a Bellanca monoplane, and the second pilot, Mr. Eric Watt Bonar, are American.

We are informed that Col. Roscoe Turner has ordered Shell Aviation Gasoline of 87 octane value for use with the "Wasp" engines in the Boeing 247 which he will fly These engines will be geared and supercharged. A visitor from America tells us that the Douglas D.C.2, nominated by Harold Gatty, is similar to the production type, except that there are no windows in the cabin, which houses additional fuel tanks.

We hear from K.L.M. that of the four aircraft entered by them two are reserve machines. It is not certain that the Fokker F.36 and Douglas D C.2 will be delivered in time. If the F.36 is too late an F.18 will be the only K L.M. entry in the Handicap race. This machine will carry some passengers and will carry the normal equipment of K.L.M. machines on the Amsterdam-Batavia service.

Air Com. Sir Charles Kingsford Smith has flown his Lockheed "Altair" ('Wasp" S.I.D.I) from Sydney to Melbourne in 143 minutes at a speed of over 190 m.p.h.

"Compawalka"

Flt. Lt. N. Comper and Mr. F. R. Walker have now started in business together as technical advisers on aviation matters Their address is Comper and Walker, Ltd., 325-328, Cecil Chambers, Strand, London, W.C.2 (Temple Bar 2941). They have already received a number of enquiries from abroad, and should be able to save foreign clients a great deal of trouble in selecting the right aeroplane. Their telegraphic address is "Compawalka Rand, London."

Monospar for Australia

A Monospar "S.T.11" has just been completed by General Aircraft, Ltd, for delivery to the Civil Aviation Department of Australia, where it will be used for communication work. This model is basically the same as that which won the King's Cup Race, but has a retractable undercarriage. The top speed with two Pobjoy "Niagara" engines will be over 155 m.p.h. and the ceiling 19,400 ft. With comfortable accomodation for four people and a duration of 4½ hr. the "S.T.11" is a very attractive machine for this sort of work.

Hawk Agents Appointed

Aircraft Sales, Ltd., is the title of a new company which has been formed by Messrs. M. Lacayo and E. S. Robson. This firm will be the London agents for all Phillips and Powis aircraft, including the "Hawk," "Hawk Major," and "Falcon." They will be maintaining a demonstration "Hawk Major" at Heston Airport. From September 1 the office address will be 53a, Shaftesbury Avenue, London, W.1. Apart from these aeroplanes the firm will deal in second-hand machines of all makes.

A Safety Switch

Capt. H. M. Salmond has designed a safety switch which has been approved by the Air Ministry for fitting to civil aircraft. The switch is operated by a spring controlled pendulum which swings when the aircraft comes into violent impact with anything, an impact which is considerably greater than that occasioned by landing. This then operates a switch disconnecting all electric circuits.

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NEW COMPANIES

AIRCRAFT SALES, LTD. Capital £5,000 in £1 shares. Objects: To carry on the business of manufacturers of, dealers in and hirers and repairers of aerial conveyances and the component parts thereof, etc. The subscribers (each with one share) are: Joan D. Wallace, 376, Strand, W.C.3, secretary, Margaret E. Shrubb, 376, Strand, W.C.2, secretary. The first directors are not named. Solicitors: Harrington, Noble & Co., Manfield House, 376, Strand, W.C.2.

YORKSHIRE AEROPLANE CLUB, LTD., The Aerodrome, Yeadon, near Leeds. Capital, £1,000 in £1 shares. Objects: To carry on, manage and control the club known as "The Yorkshire Aeroplane Club," etc. The directors are: Walter L. Hey, Weetwood Gardens, Weetwood Lane, Leeds, brewer. John L. MacAlpine, Church Gate, Bolton-by-Bowland, Lancs. Geoffrey H. Ambler, Chellow Grange, Bradford.

W. L. HOPE, LTD. Capital, £100 in £1 shares. Objects: To carry on air transport services of all kinds, to establish, maintain, work and carry on lines of aerial communications by means of aeroplanes, seaplanes, flying boats, airships and other aerial conveyances, etc. The directors are: Walter L. Hope, Air Port of London, Croydon. Marjorie Hope, Air Port of London, Croydon. Solicitors: Wingfields, Halse and Trustram, 61, Cheapside, E.C.2.

COMPER AND WALKER, LTD. Capital, £5,100 in 5,000 ordinary shares of £1 each and 2,000 deferred shares of 1s. each. Objects: To carry on business as distributors, designers, testers and manufacturers of and dealers in aircraft of every description, and parts thereof, etc. The directors are:—Nicholas Comper, Royal Aero Club, Piccadilly, W.1, aeronautical engineer; Francis R. Walker, Whites Farm, Pirbright, Surrey (director of Sound City (Films), Ltd.). Solicitors: Stibbard, Gibson & Co., 21, Leadenhall Street, E.C.3. Registered Office: 325–6–7–8, Cecil Chambers, Strand, E.C.2.

INTERNATIONAL HELICOPTERS, LTD. Nominal capital, £100 in £1 shares. The objects are to carry on the business of engineers, designers and builders of aeroplanes, hydroplanes, airships, etc. The subscribers (each with one share) are:—John H. Wallace, 30, Stuwerstrasse, Vienna, secretary. Arthur Rich, 157, Great Portland Street, W.1. C.A. Emily Mayer, 157, Great Portland Street, W.1, secretary. Secretary: A. Rich.

INCREASE OF CAPITAL

HESTON AIRCRAFT CO., LTD., Heston Airport, Hounslow. The nominal capital has been increased by the addition of £28,750 beyond the registered capital of £46,250. The additional capital is divided into 28,750 "A" shares of £1 each. The 12,500 2s. deferred shares have been consolidated into 1,250 £1 shares. The 5,000 £1 first preference, the 35,000 £1 second preference, and 1,075 £1 deferred (all issued) have been consolidated into one class known as "B" shares, and the unissued 5,000 £1 first preference and 175 £1 deferred have been consolidated into one class known as "A" shares. The nominal capital is now £75,000 in 33,925 "A" shares and 41,075 "B" shares of £1 each.

CHANGES OF NAME

COMPER AIRCRAFT CO., LTD., Heston Airport, Hounslow. Name changed to Heston Aircraft Co., Ltd., on August 10, 1934.

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PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda No. 1537. Method of Representing Spar Tests by H. R. Fisher. February 1933. Price 1/9 net London: H. M. Stationery Office, W.C.2.

International Caterpillar Club, 1925-1933. Irving Air Chute of Great Britain, Ltd. Letchworth, Herts.

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AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors.
(The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1934

Published August 30, 1934.

3090. E. D. ABBOTT, L. E. BAYNES and H. G. TRAVERS. Aircraft. (414,378)

5224 SIEMENS & HALSKE AKT.-GES. Automatic controlling-devices for the control surfaces of aircraft. (414,592.)